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UNITED STATES COMMISSIONERS

TO THE

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WILLIAM P. BLAKE,
COMMISSIONER OF THE STATE OF CALIFORNIA.

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REPORT

UPON

WOOL AND MANUFACTURES OF WOOL,

BY

E. R. MUDGE,
UNITED STATES COMMISSIONER,

ASSISTED BY

JOHN L. HAYES,
SECRETARY OF THE "NATIONAL ASSOCIATION OF WOOL MANUFACTURERS"

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WOOL AND MANUFACTURES OF WOOL.

INTRODUCTION.

The preparation of a report upon wool and manufactures of wool having been committed to the undersigned, it was his original purpose to limit himself to giving the general impressions made at the Universal Exposition of 1867 upon a business man greatly interested in, rather than technically informed as to, the woollen manufacture and the raw material supplying it. But in conformity with the views of the Department of State, that a report relating to so important a branch of national industry might take a wider scope with advantage to the public interests, the undersigned has consented to modify his original purpose, by adding to his personal observations more general views as to the present condition of the woollen industry at home and abroad, and such statistical statements, obtained from the most recent and authoritative sources, as would throw light upon its economic and social relations. In the preparation of this work he has been assisted by Mr. John L. Hayes, secretary of the National Association of Wool Manufacturers, to whom the literary execution of the report has been intrusted.

SECTION I.

WOOL AND ITS CULTURE.

VARIETIES OF WOOL IN EUROPEAN MARKETS—NECESSITY OF PROTECTION TO AMERICAN WOOLS—CLOTHING WOOLS—SILESIAN AND PRUSSIAN CLOTHING WOOLS—CULTURE OF FINE CLOTHING WOOLS IN THE UNITED STATES DESIRABLE—AMERICAN CLOTHING WOOLS—VERMONT SHEEP DEMANDED IN AUSTRALIA—MERINO COMBING WOOLS—SHEEP HUSBANDRY IN FRANCE.—ENGLISH COMBING WOOL—CHEVIOT SHEEP—PROBLEMS TO BE RESOLVED IN AMERICAN SHEEP HUSBANDRY—VAST SCALE OF SHEEP HUSBANDRY IN RUSSIA—EXEMPTION OF DUTIES ON SHEEP IMPORTED FOR BREEDING.

To commence with the raw material, the first impression made upon an American manufacturer by an observation of the woollen manufactures of Europe, as displayed at the Exposition, is the immeasurable advantage which the woollen manufacturer of Europe has in the command of an unlimited supply of wool, and other raw material of every variety, free of duty. The policy of the modern governments of Europe, unrestrained by any regard for the opinions or prejudices of agriculturists so controlling here, is first and foremost to develop the manufactures of their several countries. Freedom from duties on raw material and breadstuffs is but one mode of protection. The necessity for duties on wool as a measure of encouragement to the wool-grower has passed away. Sheep husbandry in Europe could not be extended by protective duties, as all the land that could be profitably devoted to this purpose is already occupied. England has one sheep to one and three-quarters of an acre of land, while Ohio and Vermont have one to four and a half acres, New York one to six and a half acres, Iowa one to twenty-four acres, and the whole United States one to fifty-seven acres. The perfection to which the leading varieties of European wools has attained removes them from all competition, and renders protective duties unnecessary. No lustrous combing wools can compete with the Lincoln, Leicester, and Cotswold wools of England; no clothing wools with the Saxon and Silesian wools of Germany; no soft combing wools with those of the Rambouillet stock of France. The culture of the latter wools was developed by protection until their excellence relieved them from competition, and even the agriculturists of France assented to the abolition of the duty on wool. The great centre of distribution for the great part of the wool of the world, not consumed at home, is England, the distribution being favored by her warehousing system. All the wool manufacturers of Europe are gathered at the annual sales at London. The European supply of raw material constitutes but an inconsiderable portion of the consumption of Europe. The importations have increased with marvellous rapidity.

The importations of wool into England a little over 30 years ago, viz,

in 1830, were, in round numbers, from Germany, 74,000 bales; from Spain and Portugal, 10,000 bales; the British colonies, 8,000 bales; sundry other places, 5,000 bales; total, 98,000 bales; and yet at that period, as appears from the testimony before the House of Lords, in 1828, every warehouse in England was filled with wool, and stocks were lying on hand for five or six years. In 1864 there were imported, from Australia, 302,000 bales; from the Cape of Good Hope, 68,000 bales; from South America, 99,000 bales; and 219,336 bales from other sources—in all, 688,336 bales. Australia now supplies more than three times the whole amount of foreign wool consumed in England a third of a century ago, and the production of South America exceeds the whole consumption then. The advantages which the European manufacturer enjoys over the American in the command of an unlimited supply of every variety of wool cannot be overestimated. The range of fabrication of the American manufacturer in clothing and combing wools is limited to the produce of American flocks, under the almost prohibitory duty upon those wools. The European can select from the peculiar products of every climate and soil of the whole world, which are poured into the great centres of distribution at London and Liverpool. Hence the infinite variety of European manufactures so conspicuous at the Exposition, and hence the capacity of the European manufacturer to relieve himself from home competition by changing at pleasure the character of his fabrics. It is true that the American is able to contend with the European manufacturer, who has his wool free of duty, by receiving the imposition of a specific duty on foreign cloths just sufficient to reimburse the duties on wool. Without this neutralizing duty the American could not live for a day, and with it he still suffers in the limitation of his supply of raw material.

By these observations upon the present comparative advantages of the American and foreign manufacturer in the supply of raw material, it is not to be inferred that the undersigned would advocate the application to this country of the British system of protection by the free admission of raw materials which can be advantageously produced here, or that he would for a moment maintain that the wool-grower can obtain sufficient encouragement through the protection of the manufacturer. The higher demands of American civilization require that all our industries should be defended against the cheap capital and labor of competing nations. The labor which produces the wool cannot be distinguished from that which spins and weaves it. Considerations of national independence require us to seek to the utmost possible extent all our supplies from domestic sources. The woollen manufacturer has the best assurance of permanent prosperity when he can look to an uninterrupted supply of wool from sources not liable to be cut off by war, famine, pestilence, or political revolutions abroad. The American wool manufacturer, no less than the wool-grower, has the only market for his fabrics at home, and can have a profitable market only when all the industry of the country is profitably occupied. The system of political economy essential to

industrial prosperity in this country demands that the claims of the wool-grower and manufacturer should be equally respected. If any views here presented should be regarded as suggestive of a change of the system of duties now prevailing, they should be regarded as addressed to American wool-growers alone, with the distinct acknowledgment that it is their right, after intelligent consultation with the representatives of kindred industries, to demand the duties which they shall judge to be necessary for the protection of their own.

CLOTHING WOOLS.

To return to the wools displayed in the great warehouses of Europe, and exhibited at the Exposition. The American manufacturer is struck by the variety of wools, not produced abundantly here, and first with the Silesian and Saxony clothing wools of Germany, the fleeces small and the fibre exceedingly fine, and marked by the distinctness and number of its curves or wrinkles; the staple very short, the wools distinguished for their felting qualities, both the fineness and shortness of staple being essential qualities for the fine broadcloths and doeskins, for which the German manufacturers are so distinguished. These wools have the highest price of any grown. The wools of Prussia of this character were very remarkable, and among them those exhibited by Mr. Dopping, of Silesia, are worthy of especial mention for their shortness and the distinctness of the curves, which were so sharply defined as to give the impression that they had been artificially crimped. Next to these, and scarcely inferior, are some of the Australian wools, which were distinguished for the same qualities of fineness of fibre and shortness of staple, and equally observable for their admirable condition, evincing the care with which they are washed and put up. These wools were exhibited in such quantities as to give one the impression of passing through the warehouses of London. Next in quality are the Cape wools. Last among the fine clothing wools in quality and price are those of Buenos Ayres. The German and Australian wools exhibit the highest existing type of the product of the merino race. In their culture weight of fleece is never sought for. The efforts of the grower are devoted solely to producing fineness of fibre and shortness of staple. Without the command of wool of this character for filling it is hopeless to attempt the manufacture of the best face goods, such as broadcloths and doeskins. Our foreign importation of German cloths is mainly confined to the black broadcloths, cassimeres, and doeskins made from these wools. There is no difficulty in commanding the skill required for this manufacture, as is evinced by the goods exhibited by Mr. Slater, of Rhode Island. All the difficulties of manufacture can be surmounted by the importation of German workmen. Several hundred sets of machinery could be occupied here in the manufacture of these goods, demanded for home consumption. The warps, which could be made of such American fleece as is now grown here, would take up two-fifths of the wool required for this manufacture. This

would be so much added to the demand for this character of wool. The relief afforded to the manufacturer, by being able to vary his fabrics, would diminish the competition among those compelled to manufacture only one style of goods, and, giving more profits to the manipulator of the wool, would secure better prices to the wool-grower. The great problem to be solved in the clothing-wool industry in this country is how these wools shall be secured. The wool-growers assert that they can be grown in this country, and this is by all means the most desirable source from which they could be obtained. The success in certain districts in Tennessee, Pennsylvania, and Virginia, in former times, is an assurance that they can be grown. The present supply is altogether insufficient for any progress in the fine cloth manufacture. It is gratifying to learn that importations are being made of the best Silesian stock. It is the duty of the manufacturer to encourage these efforts by discriminating in his prices for the finest wools. The growth of these wools is not a question of soil or climate, but of profit. If these desired wools are more remunerating than others, they are certain to be produced. But the solution of the problem whether we shall manufacture fine broadcloths in this country depends mainly upon the wool-growers. It is for them to decide whether or not these wools shall be grown here; if not, whether they shall be admitted at a moderate duty. If the product of the finest woolled sheep is too small to admit of profit in their culture, the only objection to their growth here, it is worthy of serious consideration by the great body of American wool-growers whether their own interests, by the greater consumption of wool, which can be profitably grown by mixture with foreign fine wools, would not be secured by admitting, at a moderate duty, the highest priced German and Australian wools, not including such as the mestiza, which compete with the wools grown here. Any movement for the development of this important branch of manufacture, whether by the growth of the desirable wools, their admission at a lower rate of duty, or by a higher specific duty upon extra fine wool cloths, must emanate from the wool-growers, for it is better that the manufacture of the highest clothing wools should be abandoned than that the harmonious arrangements between the agricultural and manufacturing branches of the woollen interest, so essential to its stability, should be disturbed.

AMERICAN CLOTHING WOOLS.

It should be clearly understood that the wools above referred to are desirable as an addition to, and not as a substitution for, the great bulk of the present American fleeces. The annual production of wool in the United States was estimated, in 1866, at 95,000,000 pounds; and it is estimated that this constitutes about 70 per cent. of the wool manufactured in this country—this wool being the product of 30,000,000 sheep, consuming 30,000,000 bushels of corn. Our domestic fleece is, therefore, the chief source of our supply. This wool is mainly of a

medium quality, and is produced from grades of the merino race. With the increasing growth of the country the demand for this wool should proportionally increase. Its great value for the purposes for which it is generally used is shown in the excellence of our peculiar American fabrics, to be hereafter referred to. There is reason to believe that the yield of scoured wool, of a medium character, from sheep of the race now recognized as the American merino,[1] which has originated in Vermont, is greater than has been obtained from sheep of the merino blood in any country except those of France. Manufacturers are apt to complain of the greasy character of this wool—a complaint too well founded with respect to wool produced from show sheep; sufficient development of yolk is, however, essential to the greatest yield in wool. It is for the interest of the manufacturer and of the country that the system of culture should be pursued by the wool-grower which shall produce the greatest amount of clean wool with the greatest economy to the wool-grower. The wool-growers, through their associations, which are now being extensively formed and conducted with an intelligence displayed in no other department of agriculture, will determine how far this production of yolk can be carried with ultimate profit, and whether the evil of excessive yolk, if it is one, may not be corrected by the infusion of blood of another stock. A very interesting and instructive fact in favor of the American merino has been stated, while this paper was being prepared, by Mr. Bowes, the eminent wool dealer of Liverpool, viz: "That Vermont bucks are now being selected to give body and quality to the degenerated wools of New Zealand."

MERINO COMBING WOOLS.

Conspicuous among the wools displayed at the Exposition were those of the merino race, distinguished for the softness and length of fibre. Those from France and Australia were the most noticeable. The wools of this kind from Australia having been derived from the French stock, the length of fibre, enabling these wools to be combed, adapts them for the beautiful dress goods for female wear, such as thibets and cashmeres and merinos, which are the most characteristic fabrics of the present century. The wool of this character produced in France surpasses that of any other country, and its possession has caused France to take the lead in this manufacture, which was not attempted in England until the wools from Australia were seen to develop similar qualities.

M. Benoville, in his admirable essay upon the combing wools of France, remarks:

"There are two facts we ought to proclaim abroad. The first is, that without the introduction of the Spanish race into our flocks, and without all the skill of our agriculturists, we should still vegetate in dependence upon neighboring nations, and should be reduced to clothe ourselves

[1] See article in the Appendix upon the "American Merino," by Dr. Randall, prepared since this report was submitted.

with their stuffs. It is to the admirable revolution in the raising of ovine animals that we owe the beautiful industry of spinning the merino combing wools. It is to this that we owe the splendor of the industries of weaving combing wool at Paris, at Rheims, at Roubais, at Amiens, and St. Quentin.

"The second is, that the aspect, the quality, the character of our modern tissues—in a word, all that makes them deserve, for 40 or 50 years, the name of new inventions—are due principally to the particular nature of the combing wool obtained by the Spanish cross. There are few, very few inventions in the contexture of the stuffs, or in their mounting upon the looms, which are still the same as in the 18th century. It is because it has been favored by the wool of merinos that the 19th century has changed the physiognomy of the tissues of preceding ages."

The French merinos are bred to produce wool for combing purposes, as this always obtains the highest price. They are of unusual size, producing fleeces of uncommon weight. Those which have been introduced into this country were not regarded as profitable; partly for their want of hardiness under our system of husbandry, but mainly because there was no demand for their peculiar qualities of fibre. There can be no difficulty in engrafting the French race upon the American merino. We have then in our own material, and that which can be readily and advantageously produced by the improvement of our race, the means of supplying a manufacture which is one of the most important in France, and furnishes a large part of the exportation to this country.

SHEEP HUSBANDRY IN FRANCE.

As it is a matter of the highest interest, as well to the manufacturer as the agriculturist, that sheep husbandry should be made profitable in this country, it will be appropriate in this connection to refer to the tendency of sheep husbandry in France to secure the double purpose of profit from wool and mutton in the culture of the merino race.

A notice by M. Gayot, member of the Imperial and Central Society of Agriculture of France, upon the merino-ovine races exhibited at Billancourt during the period of the Exposition, furnishes some interesting information upon this point. After noticing the impulse which was given to French agriculture and manufacture by the development of the imperial flocks of the Spanish race at Rambouillet, and the tendency which prevailed for many years to cultivate the merino sheep for wool alone, and referring to the first effects of the importation of foreign wools in lowering the price of those produced in France, he observes that, at this period, the abandonment of the merino sheep was earnestly urged by many French agriculturists who had become possessed with an Anglomania for the production of the long-woolled mutton sheep. This agitation, although it did not procure the abandonment of the merino race, naturally modified it. The question was finally resolved that there was no incompatibility in the production of a very good quality of wool and

a satisfactory quantity of flesh. The sheep now produced in France, with this double destination, produce a wool of medium fineness, very much appreciated, and furnish for the butcher a return in flesh satisfactory in quantity and quality.

"The new merino," says M. Gayot, "is well formed; it grows rapidly; it produces abundantly a wool of medium fineness, but of a quality much sought for for the production of medium tissues, the consumption of which has a constantly ascending progression. It is easy of nourishment; it is more rustic and hardy than the foreign races; it fattens well, and at all ages, and furnishes a product in mutton which bears comparison with all others without disadvantage, and it is notably less adipose than the so-called perfected races of England."

The consideration last referred to will be appreciated in this country; the excessive fatness of the English mutton sheep, although not objectionable to the English laborer, being distasteful to American consumers.

"No one can deny," says M. Des Farges, in 1863, "that the growers in France, who have made a good selection, and have had in view the double end of wool and flesh, have obtained as much precocity and weight with the medium-wool merinos as with the mutton races. I have seen a lamb of seven months, killed by accident, which gave a net product in flesh of 24 kilograms, and in tallow of 4.50 kilograms; the skin was worth about 8 francs. Another lamb of 9½ months gave a product, in flesh, of 32½ kilograms, and in tallow of 3.930 kilograms; its skin was sold for 10 francs. The same grower sells regularly at his sheep-fold, for the butcher, his fat sheep, including the fleece, at 30 francs for animals six months old; for 60 francs at eighteen months, and for 80 francs at thirty months.

The change effected in the French merino is thus described by M. Gayot after giving the peculiar points of the old merino: "The ameliorators of the new race have had to fulfil another programme. At first they had only to produce a short wool; this alone implied great modifications in the skin. The folds disappeared upon a more ample body, which has become lower and more elongated, more filled out, more fleshy and less bone. It is a constant physiological result that, with a given race, the less the skeleton is developed, the longer becomes the staple of the fleece. Such, then, are the new characters deduced physiologically one from the other; a more cylindrical structure; a diminution in the volume of the bone; the disappearance of the folds of the skin; a suppression of the horns; a very notable contraction of the head and of the deformities which dishonored it; a descent of the wool upon the parts of the body where it had neither quality nor value; the choice pieces, the sides (cotelettes) and legs, become more marked and acquire more weight; the wool of medium quality becomes more abundant, and is at the same time soft and long; the growth of the animal is more rapid; the fattening more easy; the return of flesh greater, and the quality more appreciable."

It was observed that the fitness of the new merino race for the cultivated and populous districts of France was so marked that the exhibitors at Billancourt of animals of the small and fine-wool Negretti race displayed them with this published precaution: "In poor countries little advanced, where the pasturage is thin and the price of flesh will not cover the cost of production, the wool ought to be the principal and often the only product of sheep. We must then attempt to obtain as much wool as possible upon animals of small size and easy to nourish." It is for our agriculturists to determine whether the facts above given can be of practical application in this country.

ENGLISH COMBING WOOL.

The possession, by England, of the long-woolled races of sheep was the foundation of her manufacturing supremacy, the worsted manufacture supplied by this wool far surpassing that of clothing wool, and having opened the manufacture of cotton. More than half of the wool of England, whose annual product is about 250,000,000 pounds, is used for combing purposes, no wool of the merino race being produced. There is no more important question to American agriculture and manufactures, and no one more nearly related to the vital question of cheap sustenance, than the inquiry whether the long-woolled mutton sheep shall be produced abundantly in this country. The present consumption of this wool is about 6,000,000 pounds. The extension of the manufacture, which has been mechanically successful here, is limited by the supply of material; were this abundant the combed-wool industry would soon take its place by the clothing-wool industry, and double the products of the woollen manufacture. That there are no physical obstacles, such as condition of soil and climate, in this country to prevent the culture of the long wools of English blood, is demonstrated by the success in the culture of this wool in Upper Canada, from which province we obtain nearly all the long combing wool consumed here, our manufacture having been stimulated by the reciprocity treaty, which admitted these wools without duty. These wools are successfully and profitably grown in the neighborhood of Cleveland, Ohio, and also in Kentucky, where a new race of long-woolled sheep appears to have been formed. The inducements for growing long-woolled sheep, especially in the neighborhood of the great cities, are, that profit is derived from three sources—the mutton, lambs, and wool—each coming to market at different seasons. The value of combing wools, as compared with the merino clothing wools, has greatly increased, and, in all probability, will continue to do so. The English combing fleeces were worth, in 1855, only 1*s.* 1½*d.* In 1864, they were worth 2*s.* 4*d.* They had more than doubled in price while the clothing wools had just about held their price; the reason for this difference being that, while the demand for long lustre wool for the worsted manufacture has greatly increased, its culture has been confined to England, Holland, and parts of Germany, while the vast regions of

Australia, the Cape of Good Hope, and Buenos Ayres, have been opened to fine wool husbandry. American agriculturists differ as to the profit of growing the wool of English blood in the United States. On the one hand, the president of the New England Society of Agriculture asserts that "the mutton sheep of England are unsuited to our climate and soil, and are neither adapted to the extensive grazing lands where flocks are fed which are counted by the thousand, nor to the small farm which cannot furnish any luxuriance of food." On the other hand, the president of the National Wool Growers' Association, with more discrimination, asserts that the Cotswolds and Leicesters are well adapted to profitable breeding in the State of New York, for mutton and wool combined, in situations where the lands are rich, unsubject to drouth and adapted to root culture, and where good city mutton markets are easily accessible; he says, "they are great favorites with dairy farmers, and with grain growing farmers who wish to keep but few sheep." If the present high duties on combing wools shall stimulate their production, they should be continued. If they fail of this effect after a reasonable trial, the intelligence of the great body of the wool-growers will lead to the reduction of duties on these wools to a revenue standard. It is for the interest of the grower of the American merino wool, that there should be a supply of long wool to develop the worsted manufacture, that thereby a demand may arise for combing wools of merino blood, for the fabrication of the soft and fine stuff goods previously referred to, the command of both kinds of wool being necessary for a prosperous manufacture, in some fabrics one supplying the warp and the other the filling.[1]

CHEVIOT SHEEP.

A race of sheep producing wool adapted for combing and special clothing purposes has been altogether neglected in this country. This is the Cheviot sheep, so extensively bred in Scotland in place of the old Highland breed, and which supplies the chief revenue of the vast estates of the noble families of Breadalbane, Argyle, Athol, Sutherland, and Buccleuch.

The introduction of these sheep would lead to the supply of a most valuable and much needed material for our manufacturers. The wool is sufficiently long to be combed and may be all converted into worsted. It is finer than the Cotswold, and can be advantageously mixed with English combing wool. Our worsted manufacturers, familiar with the working of this wool in Scotland, consider its acquisition for combing purposes, simply, as very desirable. It is, however, particularly desirable to supply an important deficiency of material for certain card wool fabrics. It is this wool, or a mixture of it, which gives their peculiar character to the Scotch tweeds and the Scotch cassimeres and coarser shawls. It is also extensively used at Rochdale for blankets, for which

[1] See letter of Mr. Walworth on "Combing Wools," in Appendix, not accessible when this report was submitted.

purpose it is specially fitted by being less liable to felt than the merino wools. We have invariably failed, in this country, in attempts to make goods corresponding to the Scotch cassimeres, so much in request.[1] The basis of these fabrics is the Cheviot wool, to which finer wools are added to give variety to the texture; their peculiar style resulting, according to the statements of Mr. Bowes, from the mixture of the coarse and long with short and fine fibre. These sheep resemble the Leicesters in general appearance, being without horns and having white faces and legs, though they are much inferior in size. They have an advantage over the Leicesters in their superior hardiness, as they thrive with conditions of keep and exposure under which the former would perish. Protected by their close fleece, which prevents the penetration of rain and snow, they bear with comparative impunity the storms of the Scottish hills and thrive on their pastures. Their limbs are of a length to fit them for travelling, and enable them to pass over bogs and snows, through which a shorter legged animal could not penetrate. In Scotland they have no other food, except when it is proposed to fatten them, than the natural grass produced on their own hills. The hardiness of the animals of this race, and the facility with which, unlike the Leicesters, they are nourished and tended in large flocks, would seem to fit them admirably for the rough husbandry of California, New Mexico, and the mountains of North Carolina. In the present state of our manufactures it is certain there would be an extensive demand for their wool.

Although it may seem presumptuous in a manufacturer to attempt to throw light upon the question of sheep husbandry, the object is more to disclose our necessities than to pronounce remedies. It is apparent that this most vital of all agricultural problems is very far from having been resolved in this country. England has resolved the question for her soil and climate, and has made the mutton sheep culture the pivot upon which her agriculture revolves, and the means of making her fields more productive in wheat than even the prairies of the west. In this country new elements enter into the consideration of this question; among them is the means of making our peculiar possession of Indian corn most available in the production of wool and mutton, and the relations of sheep husbandry to the culture of the beet for sugar, an industry destined to have a great extension at the west. Profit to the farmer and a supply of raw material to the manufacturer are not alone to be considered. With the increasing dearness of animal food the question of cheaper sustenance is coming to be as vital here as in Europe. The greater development of sheep husbandry, with a view to the supply of mutton as well as wool, will be the most efficient and quickest means of diminishing the cost of all animal food, as well as of increasing the supply of cereals by restoring our degenerating soil to remunerating cultivation. Happily the interests of sheep husbandry are receiving, in this country,

[1] Since the above was written, fabrics called Cheviots, similar to the Scotch goods, have been successfully made here.

more earnest and intelligent attention than ever before. There is no movement in American agriculture more encouraging than the vitality of the recent national, State, and county associations of those engaged in this branch of agriculture, and the vigor and talent with which the departments of sheep husbandry are conducted in the leading agricultural papers.

Recurring to the Exposition, the evidences of the vast scale upon which sheep husbandry is carried on in Russia, appearing in the notices of its exhibitors at Paris, could not fail to attract attention. Mr. Tilibert speaks thus of his flock: "It consists of 70,000 merino sheep. In 1864 it numbered 50,000 head, which gave 12,860 poods[1] of wool. Mr. Michel Bernstein, of Odessa, describes his production as follows: "The flock of Falz Feim consists of 400,000 animals. The last shearing produced 30,000 poods, washed, and sold for 870,000 roubles, or 2,974,500 francs."

Passing over the coarse wools of the Highland breed, the carpet wools of Russia and South America, the alpacas of Peru, and the Angora of Turkey,[2] all of which, with the exception, perhaps, of the latter, are of but little interest to the American wool producer, as they do not compete with any wools grown in this country, or which are likely to be grown, because other wool can be produced with greater profit, as it is not usual to raise rye on land which will raise an equal amount of wheat, the undersigned would observe that the interest displayed by all the continental governments of Europe in the introduction of valuable breeds of sheep is worthy of imitation by our own government. If the introduction, at the government expense, of valuable foreign breeds of sheep, to be confided to the Department of Agriculture, might not be deemed expedient, there is certainly every reason for favoring the importation of desirable breeds of sheep and other animals by annulling the duties on such importations.

[1] A pood is equal to 16.80 kilograms; .45341 of a kilogram is equal to one pound avoirdupois.

[2] See special paper upon the "Angora Goat," in the Appendix.

SECTION II.

WOOLLEN MANUFACTURES.

COMPARISON OF EUROPEAN AND AMERICAN MANUFACTURES.

COMPARISON OF EUROPEAN AND AMERICAN MANUFACTURES—ANTIQUITY OF FABRICATION IN EUROPE—CONSUMPTION OF THE WORLD—RELATIVE COST OF PRODUCTION IN THE UNITED STATES AND EUROPE—FRENCH WOOLLEN FABRICS AT THE EXPOSITON—CULTURE OF TASTE IN FRANCE—PROGRESS OF THE ART OF DYEING IN FRANCE—CHARACTERISTIC CENTRES IN FRANCE—BELGIUM, GERMANY AND AUSTRIA—GREAT BRITAIN—DUTIES OF AMERICAN MANUFACTURERS.

The American observer, astonished at the marvellous display of fabrics of woollen of such infinite variety and beauty at the Exposition, nearly all the products of European looms, might have been mortified at the meagre display from his own country, if he had not reflected that the woollen manufacture has hardly existed in this country more than half a century, and that even during its short existence it has been subject to a system of legislation which has been constant only in its instability. In Europe the woollen manufacture was the first art which revived after the dark ages. As early as 1395, the stuffs of Rheims sent to Bajazet II, for the ransom of French captives were regarded as the richest and most curious gift which France could offer. Both in France and England this industry received every favor which the state could render, and in the latter country its prosperity is the result of a persistent national care from the time of Edward III, unexampled in the history of industry. It could not be expected that the products of our brief experience should bear any comparison with the results of the traditions and inherited experience of centuries. The comparison of our fabrics as they were known to exist here, rather than as they were exhibited—for the display of our goods was very far from being an adequate representation of the real condition of our industry—was far from discouraging, while the recent progress in the most advanced nations gave the best assurance that we also might attain success in the boundless field upon whose borders we had entered.

The emotion most vividly excited by a general survey of the department under consideration was admiration of the wonderful qualities of the fibre, which is capable of producing objects and fabrics infinitely surpassing in variety of appearance as well as of application those produced from any other material, thus showing itself to be, of all fibrous materials, that of the first necessity to man. This fibre, we observe, is made more perfect than any other by the chemical elaborations of an animal of high organization, thus surpassing silk which is derived from an animal of a lower organic structure. Its specific gravity being the least

of all fibrous substances, its tissues are the lightest, warmest, and most healthful. This material, provided in some varieties with a structure which admits the fibres to be interlaced and intermingled by the process of fulling into fabrics distinguished for their warmth and softness, in other varieties has a lustre which assimilates its tissues to those of silk, and like silk and unlike cotton and flax it receives and permanently retains every tincture and every tone and hue which the art of the dyer can produce.

"Such," as has been said by a recent writer, "are the qualities of fibre which have led every industrious nation to the culture of flocks as the first necessity of its people; which have caused, in every manufacturing nation, the demand to constantly exceed the supply; which have transplanted colonies from the Cape of Good Hope to Australia, and have carried the shepherd emigrant to the steppes of Russia and the plains of La Plata; and which have brought the present production to such enormous figures as are given by recent German estimates, giving to Great Britain an annual production of 260,000,000 pounds of wool; to Germany, 200,000,000; France, 123,000,000; Spain, Italy, and Portugal, 119,000,000; European Russia, 125,000,000; making, in all Europe, 827,000,000; in Australia, South America, and South Africa, 157,000,000; the United States, 95,000,000; the British North American Provinces, 12,000,000; Asia, at a very general estimate, 470,000,000; northern Africa, 49,000,000; the aggregate production of wool in the whole globe amounting, by these estimates, to 1,610,000,000, or a pound and a quarter to each inhabitant, reckoned at twelve hundred and eighty-five million people."

The observer contemplating the woollen products at the Exposition as a whole would conceive that human ingenuity and imagination had been exhausted in the variety of form and application of this material; but upon comparison of the present fabrics with those which can be recalled by one of middle age it will be observed that nearly everything now seen is the product of modern times and was almost unknown in the past, the very variety or fantasy of stuffs being an idea of the present age, a variety not only due to the infinite combinations which are effected by modern looms, but by an alliance of woolly fibre with other materials, cotton, silk, flax, and the hair of the goat and vignone and alpaca, and by new dyes which modern chemistry has discovered. Seeing this, no one could fail to be impressed with the thought that of the great industries there is no one offering so wide a field for invention and imagination, and consequently no one whose pursuit is more identified with national progress in intelligence and taste. Looking more closely, but still somewhat generally, at the goods exhibited by the different nations, there might be observed a certain national character in each, which could be felt, but not easily described. It was an individuality like that which enables one to recognize the birthplace or race of a stranger by something of air or tone so slight that it can be hardly defined.

The products of the eastern nations were more marked; the carpets and rugs of Turkey showing a product from the broad-tailed sheep of Asia, the most ancient of the present races, and the fabric unlike anything made on our own looms, probably as old as the Crusades. The shawls of India, the most wonderful of all the monuments of textile labor, exhibit in the palm pattern a design which has probably been preserved for thousands of years, and a fabric called esponline, known from specimens still preserved to have existed as early as the year 835.

Coming to the European nations, and passing over France, for a more detailed notice hereafter, we observe in the cloths of the west of England, solid and strong as its oak, rather than soft and lustrous, the qualities which were given by the sturdy honesty of former times. In durability these cloths are unsurpassed by the fabrics of any nation. Their production is, however, an exceptional one, the tendency of the English being to manufacture for the utmost possible consumption of the masses without regard to wearing qualities. This is shown by the skill displayed by them in the adulteration of wool, by the substitution of cheap material such as cotton and shoddy in the filling, and by making warps wholly of cotton. In cheap or adulterated goods of admirable finish and appearance the English are unsurpassed. The introduction of shoddy as a manufacture was made by them, and they have consumed in a single year 65,000,000 pounds of this material, more than our whole clip of wool in 1860. In the use of new auxiliary materials in the woollen manufacture, such as the hair of the goat and alpaca, and even cow's hair, in the combination of wool with cotton warps in all the coarser fabrics from her own combing wool, and in the substitution of power for hand labor, the English surpass all manufacturing nations.

Belgium, although provided with little wool of native production, is noticeable for the excellence of its broadcloths, cassimeres, and doeskins, as well as for their cheapness, resulting from the exceedingly low cost of labor. In its combed wool fabrics it is distinguished for the facility with which it copies and appropriates and transforms into cheaper tissues the original designs of Roubaix and Paris.

Rhenish Prussia, having the command and the first selection of the incomparable wools of Germany, has preserved the reputation which it acquired in the 13th century and exhibits card-wool products, particularly the black-faced goods, which in excellence of manufacture, general utility, and cheapness, surpass those of any other nation.

Austria, with its leading manufacturing city, Brunn, in the very heart of the pastoral province of Moravia, is eminent for the originality of its card-wool fabrics, particularly those for women's wear, their showy and unique patterns, and for the vividness of its dyes. Nothing can equal the purity of the white cloths which form the uniform of the Austrian troops.

Russia exhibits a condition of manufacture similar but inferior to our

own, that of a young country of great enterprise and activity, but whose triumphs in the textile arts are still to be won.

The manufactures of the leading nations in card-wool fabrics may with propriety be ranked as follows:

Rhenish Prussia, first for men's wear; France, first for women's wear; Austria, second for women's wear; France, second for men's wear; Belgium, third for men and women's wear; Prussia, fourth for men and women's wear; England, fifth for men and women's wear; the United States, sixth for men and women's wear; Russia, seventh for men and women's wear.

In combing wool fabrics for women's wear France is first and England second, the other European nations showing nothing to particularly distinguish them from each other.

The districts in Europe distinguished for their excellence in card-wool fabrics were marked by the awards of gold medals, no medals of this class having been awarded to individuals. Gold medals were awarded to the Chamber of Commerce of Elbeuf, France, for the towns of Elbeuf and Louviers; the town of Sedan; the south of Scotland, comprising the towns of Dumfries, Galashiels, Hawick, Innerleithen, Langolm and Selkirk; the west of England, comprising Gloucestershire and Wiltshire; the province of the Rhine, Prussia; the province of Silesia, Prussia; the Chamber of Commerce of Brunn, Austria; the arrondissement of Virviers, Belgium; the arrondissement of the Riga, Russia.

The incompleteness of our exhibits very properly excluded this country from an award of the highest rank in this department.

It will be convenient in this connection to make a more minute comparison of our fabrics with those of European nations, having particularly in view our fabrics as they are known to be produced here. We cannot be said to occupy a national position in the woollen manufacture except in card or clothing wool fabrics, our success in other departments being exceptional. Our work has been in the direction demanded by the prime necessities of our people and the peculiar character induced by the nature of our raw material. Our peculiarly national wool manufacture is comprised in the production of all the varieties of card-wool tissues from flannels inclusive to the finest-faced broadcloths, which are only exceptionally included. Within this range, comprising plain, fancy, domet, and opera flannels, blankets, woollen shawls, satinets, the infinite variety of fancy and silk-mixed cassimeres, sackings, repellants, tricots, beavers Esquimaux, escredons, cloakings, our success has been complete and our progress within the last five years truly astonishing. In nearly all these productions we can vie with any nation in excellence, soundness, and taste of manufacture, and in some of them in cheapness. These goods it must be remembered furnish all the absolutely necessary card wool-clothing for our population, and all that the great majority of our people are inclined to wear at any time, a very small part of the population of the cities wearing occasionally, only, the fine and high-priced black

cloths. A small part of our population, it is true, prefer to purchase cloths of foreign make to distinguish themselves from the masses, but they are of the same class who in France, under the empire, when cotton stockings were prohibited, preferred smuggled cotton stockings to silk, because they could be only obtained at double the cost of the latter. Fashion all over the world demands the use for common wear of the medium mixed and fancy cloths in place of those of high finish. These we can produce from the admirable medium wools grown upon our own soil, and thus the American clothing-wool manufacturers and wool-growers are able to perform their part in one of the first duties of a nation, that of clothing its own people. In the class of goods referred to there is no need whatever of foreign supply, and none would be sought abroad if there were among us that national sentiment in favor of home production which prevails among the nations of Europe. Notwithstanding the freedom of exchange among European nations, the national sentiment is found to be the most efficient encouragement of domestic production. The lustrous German cloths so freely sold here find no sale in England. The London tailors who visited the Exposition reported that there was nothing on exhibition which would compare with the cloths of England. How different is the practice with the tailors and retail dealers in this country who persistently foster the unpatriotic prejudice in favor of foreign goods, because they can obtain larger profits on the foreign article than on the domestic, as the cost and quality of the former are less generally known than of the latter.

To specify more minutely the comparative qualities of American goods: In the whole range of fancy cassimeres, including the mixed goods of silks and wool, in style, taste, perfection of manufacture, and strength of material, we excel the English, and nearly approach the manufactures of France. The same may be said of the whole range of flannels, colored and plain, and of the Esquimaux and Moscow beavers, which we have imitated from the Germans. In the low cost pilots, used as substitutes for the beavers, sightly to the buyer but trashy in wear, it must be admitted that we can hold no comparison with the English. In all the grades of woollen shawls which can be fabricated of American wool we successfully vie in fabric and cheapness of price with the Scotch, who are confessedly at the head of this branch of manufacture. In the class of all-wool goods of light weight, made in all varieties of colors, denominated sackings and cloakings, and largely sold for women's wear, the fabrics are now sold in this country, at prices reduced to a gold standard, cheaper than any similar fabrics are sold in Europe. Goods of this character, displayed in the American quarter of the Exposition, and marked at their net gold prices, attracted great attention for their cheapness, and constant applications were made for their purchase.

In some other branches of the woollen industry, besides that of card wool, especially those where we have equal facilities with the European manufacturer in obtaining raw material, our productions bear a favora-

ble comparison. American carpets are fully equal, if not superior, to the English carpets of similar grades. In the American Brussels and tapestry carpets there is no inferiority in designs, colors, or texture. In fact they are woven here and in England by the same machinery. The American retail purchaser is invariably compelled to pay a higher price for a foreign carpet of the same grade; that is, he can purchase a better American carpet at the price of the foreign article. The American ingrain carpet, which is much more largely consumed, is unquestionably superior to the English. This is evinced by the fact that the yarns used in English carpets are not sufficiently strong to admit of their being woven in power looms, as is done in this country. There is a prevailing prejudice against American dyes in carpets as well as in other fabrics. No prejudice could be more unfounded. The same chemical agents and the same processes are used here as abroad. We have in our establishments the best dyers that the better prices of labor paid here can seduce from Europe. One manufacturer of opera flannels exhibits patterns of eighty different hues on one card. In the present state of the art of tincture in Europe and this country bad dyeing results not from want of skill, but the intentional use of cheap materials, and the risk of getting evanescent dyes is much greater in purchasing cheap imported goods than in buying the products of well-known American manufacturers, who only use inferior dyes when purchasers insist upon cheaper goods.

The following extracts from the last annual report of the National Association of Wool Manufacturers are confirmatory of the views above given of our recent progress in the woollen manufacture:

"During the war, the standard of excellence in our goods was undoubtedly far too low, and discredit was thrown upon our national production. Home competition, the inevitable result of protection, is now for excellence; and the vast improvement exhibited the present year is the subject of universal comment and surprise with the leading merchants. The leading organ of the dealers in dry goods—the Economist, a well-known free-trade advocate—declares as follows: 'It can be truly said of our manufacturers this season, they have made wonderful progress over last year. Such continued improvements in the manufacturing of woollen goods will soon place us beyond the name of rivals, and cause our products to be imitated the world over, as our most choice styles and salable patterns are the result of American ingenuity, both in coloring and in style.' As the admissions of an opponent are legitimate testimony, we may fairly quote in this connection the declaration of the same organ, that 'a great impulse has been given to domestic manufacturers under the influence of the high tariff, and the result is seen in the splendid display made by our woollen mills.'

"Our progress has not been limited to improvements of old fabrics in style or economical production. Many new fabrics have been successfully achieved. Among the notable examples of recent introductions

may be specified the silk-mixed cloths, having threads of silk incorporated with both the warp and the filling; adding strength to the texture, and giving agreeable neutral shades to the surface. It is admitted that the American products of these goods, which are largely consumed, fall short in no respect of their German prototypes. The introduction of these goods is interesting, as aiding in the development of a kindred branch of American manufactures, all the silk used in these goods being spun in this country. The consumption of silk is by no means inconsiderable, that consumed by one manufacturer, for this class of goods, exceeding annually $80,000 in value. The silk and wool manufactures are united in another fabric of great beauty, largely made in Connecticut—the Irish poplins, composed of worsted filling, which is covered completely by a warp of silk. This beautiful addition to our products of luxury, it is hoped, is the harbinger of a broader extension of the silk manufacture, which needs only sufficient protection to take its place in this country with the manufactures of wool and cotton.

"The great perfection which we have attained within the last two years in the manufacture of the class of cloths styled Esquimaux beavers, for overcoatings, is worthy of especial commemoration. Five years ago all the goods of this class, consumed in this country, were imported. The cheapness and excellence of the goods of this class recently fabricated here have led to the exclusion of the foreign product. The goods of this class, manufactured by the Germania Mills, exhibited at the Paris Exposition, received the award of a medal of high class.

"Marked improvements have been made within the last year or two in the production of knit goods. Until quite recently the manufacture of shaped stockings, shirts, and drawers, made abroad wholly on hand machines, has not been attempted here. An American machine now performs automatically the narrowing and widening of the best class of knit goods, which is done elsewhere by hand. A great difficulty in the manufacture of knit goods has been the seaming, which, when done by hand, involved the distribution of the work to the homes of the skilled women by whom the work was finished at great cost. Within the last year a machine has been perfected by American ingenuity for seaming automatically. In one establishment a hundred little girls are employed on these machines, earning from half a dollar to a dollar a day, and accomplishing the seaming more perfectly than it was ever done by hand. Thus a completely shaped knit article is produced entirely by power, equal in all respects to the goods of the most celebrated English makers; while they are afforded at materially reduced prices.

"Of recent novelties in our manufacture, the fabrics which have attracted most admiration are the cloakings, so largely introduced during the present season. Even experienced manufacturers are astonished by the new range which is given to the application of woolly fibre, by the surprising variety of styles and effects obtained, and that they are capable of being produced by machinery. The models which gave the idea

of the fabrics produced here, originally conceived and executed in Austria, under a protective system of over seventy per centum, first appeared at the London Exposition in 1862, and were regarded as marked features of the Exposition. To the genius and enterprise of a young manufacturer of Rhode Island is due the conception of reproducing the Austrian inventions in this country. He was able to carry his conception into practical execution, by personal observation and actual labor in the Austrian mills. Not content with imitation, he introduced new styles and textures adapted to American wool; and the goods now produced by him, and by other manufacturers who have followed his example, although purely American in design, are in no respect inferior to the foreign models; while they are sold at from two to three dollars less than the prices at which the imported goods can be afforded, the American goods being woven by machinery, while the Austrian goods are woven by hand."

The highly respectable position occupied by the United States in the card-wool industry was indicated by the awards at the Exposition. It has been observed that no higher award than a silver medal was made to any individual or single establishment in this class. Among the 102 awards of the silver medal in this class, the 66th in number, and the first to an American exhibitor, was one for cloths manufactured by the Washington mills, of Lawrence, Massachusetts, exhibited as illustrative of the average styles and quality of the woollen goods now made in the United States. These fabrics, 30 in number, were not made for the Exposition, but represented the daily average products of the mill. Upon each sample a card was affixed, stating the selling price in this country. The jury, in making this honourable award, had in view the excellence and variety of these fabrics, their fitness for general consumption, and the reasonableness of the prices at which these goods are afforded in this country. The award was an important testimony in behalf of American fabrics, as the production of this mill, although undoubtedly equalled in quality as to some fabrics by many others here, is the largest in the country, and ranks among the most considerable in the world.

A silver medal, being the 67th in number, was awarded to the Webster woollen mills, of Massachusetts, S. Slater & Sons, for the admirable card-wool fabrics, consisting of black broadcloths, doeskins, castors, &c., produced in this establishment, their excellence placing beyond question our capacity of production in this department, with a sufficient supply of the requisite raw material. A bronze medal was awarded to Mr. H. Stursberg, of New York, for beavers, fully equalling those of German make, produced at the Germania mills, in Holyoke, Massachusetts. A bronze medal was also awarded to the Mission woollen mills, of San Francisco, California, for card-wool fabrics. The blankets exhibited from California would have done credit to any of the older States.

It is greatly to be regretted that no samples were displayed of our

productions in other departments of the woollen industry in which we have made much advance, as in carpets, knit goods, and delaines.

The department of combed wool manufactures, which in England and France employs the larger part of the capital and labor engaged in the woollen industry, we may be said to have scarcely entered upon, so vast is the field still unoccupied. Our progress in the cotton manufacture has directed our efforts principally to one branch of the worsted industry, the manufacture of the mixed fabrics with a warp of cotton and a filling of wool or worsted, which are classed under the generic name of mousselines delaine. In this manufacture we are favored by the character of our native wools. In consequence of the domestic manufacture of this fabric, the importation of printed delaines has almost wholly ceased, our goods being softer, owing mainly to the qualities of domestic wool, and taking color better than the competing imported fabrics. Of these goods not less than 60,000,000 yards are made here, which are all consumed in this country. This manufacture is peculiarly interesting, as one of the American establishments engaged in it was able to present to the Exposition a most honorable illustration of the manner in which the interests of the manufacturing proprietor, and the material, moral, and intellectual well-being of the workmen, are harmonized in this country.

A special jury was constituted at the Paris Exposition to award prizes to persons, establishments, and localities which, by a special organization or special institutions, have developed a spirit of harmony among all those co-operating in the same work, and have provided for the material, moral, and intellectual well-being of the workmen. In response to a call from this jury, the manager of the Pacific mills, situated in Lawrence, Massachusetts, presented a statement of the operations and conduct of this establishment, and received the distinguished award of a grand prize, consisting of a gold medal of the value of 1,000 francs and 9,000 francs in gold; similar awards having been made to 13 persons, establishments and localities in other parts of the world. The following facts are condensed from the paper of Mr. Chapin, which will be found in full in the appendix:

This establishment was erected in 1853, at a cost in capital of \$2,500,000. Its machinery is propelled by a fall of water of 1,500 horse-power. The average sale of manufactured goods, consisting of printed delaines and calicoes, has exceeded for some years past \$7,500,000. It employs about 3,600 work people; of these there are 1,680 men and 1,510 women; the rest consisting of boys and girls from 10 to 18 years old.

In the origin of the establishment provision was made to secure the material, moral, and intellectual welfare of the workmen, both as a duty to them and as a measure of self-interest to the proprietors. The *material* interests of the workmen are provided for by the construction of cheerful, comfortable, and well-ventilated workrooms; also, in the construction of dwellings for families of work-people, which are furnished at a rent equal to one-eighth of the wages of the head of a family; and, secondly, by the

erection of large buildings, used as boarding-houses, for the use of single females, whose residences are at a distance. These houses are provided with rooms accommodating two persons in each, the female operatives paying about one-third of their average wages for lodging, food, lights, and washing in these boarding-houses.

Another instrumentality for the material welfare of the workmen is an association for mutual relief, of which each person employed by the company *must* be a member. This association provides for any sick person who has paid from two to six cents, for at least three months, a weekly allowance for a period of at least 26 weeks, of from $1 25 to $3 75. In the course of 12 years this association, to which the company contributes weekly, has expended for the benefit of sick members a sum exceeding $25,000.

For the *moral* protection of the large number of females employed by the company, the boarding-houses are controlled by persons carefully selected to influence this class of persons, and to act in the place of guardians. Unmarried men are never allowed to lodge in the boarding-houses, and married men only in rare instances, when accompanied by their wives. The doors of the houses are locked at 10 o'clock at night. It is impossible for an openly vile person to remain connected with the company. Men of intemperate or general bad habits are excluded, and it is an established principle that all profanity, or any bad example, or severe use of authority among the head workmen, must be strictly avoided, especially when these overseers have in charge females or young persons.

For the *intellectual* culture of the workmen there is a library, established by the contribution of one cent per week from each person employed, containing at present more than 4,000 volumes. This institution is under the control of the workmen. Separate rooms, supplied with newspapers and current periodicals, at all times comfortably warmed and lighted, and accessible at all hours, are provided for males and females. The number of work-people who cannot make use of this library, from being unable to read, does not exceed 50 in 1,000, and these are universally of foreign birth.

The advantages resulting to the employers from this care for the elevation and welfare of their operatives, and to workmen themselves, are: There have been no *strikes* among the work-people; they have been encouraged to feel that any grievance will be patiently listened to and frankly discussed, and the result has always been favorable to good order; a higher class of workmen has been secured, especially among the overseers, who engage the laborers in their different departments, and give a character to the mass; the work-people have been enabled to invest their surplus earnings largely in savings banks, such deposits largely exceeding $100,000 at the present time; many work-people own houses free from debt, more than $50,000 being thus invested; several workmen have become owners of the stock of the company—the stock so held has

a present market value exceeding $60,000; many of the workmen have become members of the city government in its board of aldermen and common council; finally, the pecuniary success of the company has warranted a liberal payment of wages.

The least sum now paid in weekly wages to the youngest employé is $1 82, gold, and the number belonging to this class is very small. Boys of 16 years do not receive less than $2 85, gold, weekly. The least amount paid weekly to men is $6 75, gold; while a very large majority receive much more. Females receive from $2 48, gold, weekly, or about 12½ cents for the least, to $6 72, gold; while a few earn more. This excepts young girls, whose wages are the same as the least sum named above. Spinners, weavers, and a few others, are paid in accordance with the product, some of them earning very large wages.

No comment is needed to give force or application to these facts, which may find their parallels at the Washington, Middlesex, and Salisbury mills, and most of the large establishments of New England. These facts can be better appreciated by comparing the social influence of the American system of manufacture, as above exhibited, with that of Roubaix, to be hereafter described, where fabrics similar to those of the Pacific mills are produced. The woollen manufacturers cannot claim for their industry alone the credit of harmonizing the interests of employers and workmen. They must divide their honors with the Lowells, Appleton's, and Jackson's, of the past generation, the early promoters of the American cotton manufacture, of which the woollen manufacture in New England, in its present form, is an offshoot. The benevolent forethought exercised by these excellent men to preserve the moral character of our rural population in the change to a new form of industry, whose influence elsewhere had proved so deleterious, is referred to by Mr. Nathan Appleton in his "History of the introduction of the Power Loom and the origin of Lowell." After modestly attributing to Mr. Francis C. Lowell, with whom Mr. Appleton had been associated since 1811, "the credit of having first introduced the new system in the cotton manufacture under which it has grown so rapidly;" and observing that Mr. Lowell's "care was especially devoted to arrangements for the moral character of the operatives employed," Mr. Appleton continues: "The introduction of the cotton manufacture in this country, on a large scale, was a new idea. What would be its effect on the character of our population was a matter of deep interest. The operatives in the manufacturing cities of Europe were notoriously of the lowest character for intelligence and morals. The question therefore arose, and was deeply considered whether this degradation was the result of the peculiar occupation or of other and distinct causes. We could not perceive why this peculiar description of labor should vary in its effects upon character from all other occupations. There was little demand for female labor, as household manufacture was superceded by the improvements in machinery. Here was, in New England, a fund of labor well educated and virtuous. It was

not perceived how a profitable employment has any tendency to deteriorate the character. The most efficient guards were adopted in establishing boarding-houses, at the cost of the company, under the charge of respectable women, with every provision for religious worship. Under these circumstances the daughters of respectable farmers were readily induced to come into these mills for a temporary period. The contrast in the character of our manufacturing population compared with that of Europe has been the admiration of the most intelligent strangers who have visited us. The effect has been to more than double the wages of that description of labor from what they were before the introduction of this manufacture. This has been in some measure, counteracted, for the last few years, by the free-trade policy of the government; a policy which, fully carried out, will reduce the value of labor with us to an equality with that of Europe."

The opprobrious epithet of "white slavery" has sometimes been applied to the labor in the New England factories. No aspersion could be more unwarranted. The founders of the prevalent New England factory system carefully purged it from every element of feudalism. They avoided the English plan, which had been at first introduced elsewhere, of employing families in the mill, often including children who should have been at school, the families being kept in a state of absolute dependence upon the mill, and exposed to suffering whenever there was any interruption in the business. They abolished the custom of payment by orders on a factory store, which tended to involve the workmen in debt and dependence, and instituted the practice of weekly payment of wages in money. They provided comfortable boarding-houses, which attracted work-people of mature age from the distant rural homes, to which they could return when the business of the mill was interrupted, a system which greatly favored the freedom of movement of the laborer, and they abjured all attempts to exercise political or religious control upon the workmen. In fact the independence of the laborer secured by these measures was one of the most marked features of the new era in the manufacturing business of New England.

A more important point of comparison between American and foreign fabrics is the relative cost of production of such manufactures, as we have most successfully achieved here, measured by the only correct standard, the relative expenditure of human labor required for such production. The solution of this question will determine whether we have such natural or acquired advantages as will justify the encouragement of this manufacture as a national industry. In pursuing this inquiry we can fix upon no single representative article of uniform quality and value; such as a ton of pig iron, the relative cost of which would determine the comparative advantages of the American or foreigner in the manufacture of iron. The infinite variety of cloths forbids the selection of any one as the standard of comparison, even if it were possible to obtain data from the books of foreign manufacturers. This question must be solved for the products of the card-

wool industry, generally, by comparing the efficiency of our system, processes, and machinery of fabrication. The many practical manufacturers who have recently visited Europe for the express purpose of studying its industries concur in declaring that, in these respects, we are on an equality with the most advanced nations. Laying aside the supposed advantages which we have in the possession of water-power, upon which far too much stress is laid in popular estimates, we apply everywhere in our fabrication of woollens the factory system and make the utmost use of mechanical power, while handicraft processes are still largely used abroad, especially in weaving. For the preparation of card-wool no machinery at the Exposition equalled in efficiency the American burring machinery exhibited there, such as is in general use here. In the carding of wool no improvements were seen at Virviers, one of the chief centres of the card-wool industry in Europe, which we do not have in use. About the same number of hands were employed at the cards as here. Spinning in large establishments abroad is usually performed by mules, while jack spinning is more generally adopted in New England, as better suited to the different qualities and quantities of yarns demanded by the variety of fabrics usually produced in our mills. The mules used here are of equal efficiency with those in the best mills in Europe. With respect to weaving, it was remarked that looms were being constructed at the machine shops at Virviers such as we would not put into our mills to-day. It was also remarked that no European looms for weaving fancy goods were shown at the Exposition which would bear comparison with the Crompton loom, and even upon that admirable machine great improvements are known to be in progress. The other processes of manufacture, such as dyeing, are the same as in Europe. When we take into consideration the greater energy and intelligence of our better fed and better educated workmen, the necessary use of every labor-saving process on account of the higher cost of labor here, and the admitted superiority in construction of American machinery, it may be safely asserted that a yard of cloth is made in this country with less hours of human labor than one of equal quality and the same degree of finish abroad. In other words, a week's labor will produce more yards of cloth in an American than in an European mill. But it is said that a yard of cloth costs less in Europe than in the United States. Even this statement requires qualification, for the American laborer can purchase here more yards of cloth by the produce of a day's work than the European laborer, the ratio of the price of cloth in this country, to-day, not being in proportion to the ratio of the rate of wages of ordinary labor. It is still true that the money cost of producing cloths is greater in this country than in Europe. From what has been said it is apparent that the greater money cost of fabricating cloths is not due to any want of natural advantages, or any deficiency in skill and effective labor on the part of the American manufacturer. It is not true of this industry, as is often asserted by theorists, that it has a sickly and hotbed growth,

sustained only by artificial stimulus, and rendering its productions as unnatural, to use Adam Smith's often quoted comparison, as that of wine produced from grapes grown in the greenhouses of Scotland. The higher cost of production in this industry is due, solely, to national causes inherent to the condition of a new country and a progressive people, to the higher rates of the interest on capital required to initiate and sustain industrial enterprise, and the higher rates of labor demanded by the greater social and educational requirements of our industrial population.

The facility with which capital is obtained abroad on account of the low rates of interest is an advantage which has been too much overlooked. The language of Burke, uttered 80 years ago, respecting the advantages of England over France, may be applied with equal force by all the nations of Europe to our own: "Our capital gives us a superiority which enables us to set all the efforts of France to rival our manufactures at defiance. The powers of capital are irresistible in trade; it domineers, it rules, it even tyrannizes; it entices the strong and controls the weak."

The following table showing the comparative rates of interest in England, France, and the United States is so instructive that no apology will be required for its reproduction:

Years.	England.		Bank of France.	United States.
	Market.	Bank.		
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
1846	3.79	3.21	4.00	8.35
1847	5.85	5.21	4.92	9.54
1848	3.21	3.71	4.00	15.12
1849	2.31	2.94	4.00	10.08
1850	2.25	2.52	4.00	8.02
1851	3.06	3.00	4.00	9.68
1852	1.91	2.15	3.21	6.42
1853	3.67	3.69	3.21	10.21
1854	4.94	5.31	4.33	10.37
1855	4.67	5.64	4.42	8.96
1856	5.90	5.90	5.54	8.92
1857	6.69	6.59	6.00	12.77
1858	3.15	3.23	3.67	4.99
1859	2.74	2.74	3.46	6.59
1860	4.42	4.42	3.67	6.80
Mean rate for the 15 years	3.90	4.02	4.16	9.12

In presenting this table, showing that the average rate of interest paid here during the 15 years ending with 1860 was more than double the average on the other side, Mr. Bigelow observes: "Remarkable as this difference may seem, it is such, in kind, as must always distinguish countries comparatively new, and partially settled, from those of longer standing. Neither the laws nor the condition of the United States can be considered favorable to great accumulations of capital. Existing, as

it does here, in amounts comparatively small and widely distributed, the price of its use must, in general, range high, so long as we have land in so large proportion to the number and wants of the population. The assimilation of our condition in this respect to that of England must of necessity be gradual and slow, awaiting and following the occupation of our yet unpeopled territory, and the full development of our internal resources."

The prices of labor abroad, details of which will be hereafter given, and particularly in Germany and Belgium, which are our most formidable competitors, will be shown to be not more than half the rates paid here, being reduced to the lowest sum which will support existence. Having placed ourselves upon an equality with other nations in enterprise and skill, our power of unaided competition has reached its limit, and our woollen industry could not sustain itself in competition with foreign production unless placed upon an equality in the command of capital, or unless the disparity against us were neutralized by legislative provisions. It is only to neutralize the foreign advantages of cheap capital and labor that protective, or, more properly speaking, *defensive*, duties are demanded by the woollen manufacturers. The duties on wool paid by the manufacturer, and theoretically reimbursed by the specific duties on the cloth, are demanded by the American wool-growers for the same reason. We speak only for our own industry, and with respect to that it is asserted, with the utmost confidence, that every spindle and loom employed in it would be stopped by the breaking down of the defensive barriers existing in tariff legislation. Capital and labor already employed with the utmost possible effectiveness, in the present state of the art, would not withstand for a moment an unaided conflict with foreign industry wielding capital and labor acquired at half the cost of our own. The feeble obstacle of transportation, so often magnified into an advantage in our favor, would be but a feather-weight in our scale of advantages. Abandon the woollen industry, and 200,000 workmen are thrown upon the land for employment; the markets for agricultural products for these workmen and their families would be cut off. Sheep husbandry, supported as it is solely by the American manufacture, with all its incidental advantages of supplying cheap food and enriching the soil, would be abandoned; its 200,000 laborers would be driven to other branches of agricultural labor. The coveted boon of cheap tissues would last only through the brief period during which our own manufacturing industry is being swept away. Apply this system to all American industry, and we become a mere agricultural people, vegetating in the hopeless apathy and upon the low plane of civilization of Turkey, Ireland, and our own southern States.

We may appropriately dwell at some length upon a point above adverted to, the absolute dependence of American sheep husbandry upon the domestic American manufacture. It has been often said that this country can advantageously grow wool for export. The fallacy of this notion is well exposed by Dr. Elder, who has compared our exportations of wool

with the importations of toys and playing cards to illustrate the insignificance of wool exports. In the seven years 1858–'64, inclusive, our aggregate exports of domestic wool to all countries amounted to $1,725,799, and two-thirds of this was to bordering nations on our own continent, from whom we imported more wool than we exported. In the same period the toys and dolls imported were valued at $2,483,489. In the year 1860 our exportations of wool to all the manufacturing countries of the globe were of the value of $20,136, and our importations of playing cards amounted to $19,238. It is clear that we have never had a foreign market for our wools, and the higher cost of labor which prevents exports of woollen goods must limit the production of wool to domestic consumption. The success of our domestic woollen industry thus becomes identified with our agricultural prosperity. Such considerations would seem to place it beyond all question that our national interests require that we should repel the cheap fabrics of Europe even at considerable sacrifice, that we may appropriate for ourselves the labor and profit of their production. Such was the conclusion of the continental nations of Europe, when peace restored the nations to labor, at the close of the great wars of Napoleon. England then had the command of all the markets of the continent, and was ready to fill them with her cheap fabrics; each nation of the continent refused them, and built up its barriers of defensive duties, and with what results to their own wealth, and the industrial progress of the world! "Instead of a single workshop Europe has the workshops of France, Russia, Austria, Prussia, Belgium, Sweden, Denmark, Spain; each clothing its own people with substantial fabrics; each developing its own creative genius and peculiar resources; each contributing to substitute the excellence of competition for the mediocrity of monopoly; each adding to the progress of the arts, and the wealth and comfort of mankind."

THE WOOLLEN INDUSTRY OF EUROPE.

Not the least of the advantages which the European manufacturer possesses is the superior facility which he enjoys of observing the processes and comparing the best products of the most advanced nations. It is hoped that the notices of the woollen industry of the leading manufacturing nations which follow may have some effect in stimulating our own manufacturers to study personally the operations of the most instructive establishments abroad, and at the same time convey to the general reader a more vivid impression of the important part which the woollen industry plays in the industrial movement of the world.

FRANCE.

England and France are nearly equal in amount of production, but in excellence France is at the head of all nations in the manufacture of wool. Her products are the most worthy of being our models. Her native wools most resemble our own. It seems appropriate, therefore,

that we should avail ourselves of the full information conveyed by the vast display of her products at the Exposition and the precise documents furnished by French publications of authority, and occupy a considerable portion of this report with statements respecting the French industry.

The leading woollen fabrics at the Exposition were arranged in two classes—29 and 30. Class 29 comprised yarns and tissues of combed wool, including combing wools, yarns of combed and carded wool, tissues of pure combed wool, flannels and fancy stuffs of wool carded and slightly fulled, and tissues of combed wool mixed with other materials. The principal centres of production of these articles in France are Rheims, Roubaix, St. Quentin, Amiens, Mulhouse, Saint Maine, Aux Mines, Rouen, Fourmies, Cateau, and, finally, Paris. The following facts are derived from the committee of admission of this class:

In 1835 the wools of France played relatively a more important part than at present in the supply of her manufactures. At that period the wools of Australia were little known, of which, in 1865, 23,000,000 kilograms were used. On the other hand the importations from Spain, Germany, Turkey, and Algeria have not lost their importance, having amounted, during the year 1865, to nearly 50,000,000 kilograms. The great increase of supply has come from Australia. These different wools are now combed and spun by machines of great perfection. The weaving of stuffs of wool or dress goods by power was hardly attempted in 1855, but since 1862 has had a rapid development, which increases every day. The weaving by hand has not diminished, but has remained nearly stationary, while the great increase of production is due to the use of machinery driven by power. The number of workmen employed in power weaving is much less than those working at home by hand. The number of females employed in combing, spinning, and weaving is estimated at about one-half the whole number of operatives in some districts, and one-third in others. All the combed wool fabrics made in France have been much lowered in price since 1855. The exportations of manufactures of wool of all kinds have increased from 165,000,000 francs ($33,000,000) in 1855, to 396,000,000 francs ($79,200,000) in 1865. The yarns and stuffs of combed wool are valued at 279,000,000 francs, ($55,800,000.) The improvements observed are: new methods of combing and spinning; ingenious means of printing, facilitating the labor of the workman and the effectiveness of the machine; and the application of the products of aniline as a dyeing material.

The French products of class 30, comprising yarns and tissues of carded wool, form four principal series: 1. Soft, black, and uniformly colored cloths, cloths for billiard tables and carriages, black-faced goods, called satins, and beaver cloths; 2. Fashioned or fancy cloths for paletots and women's garments; 3. Novelties for pantaloons; 4. Articles for waistcoats and complete garments. These products are manufactured by establishments situated in five principal groups:

1. The group of Normandy, the centre of which is the town of Elbeuf. This city and Louviers, and the towns of Vire, Lisieux, and Romorantin, produce specially fabrics for general consumption, such as fancy and pilot cloths, novelties for pantaloons, and articles of wool velvet, and cloths for women's garments.

2. The group of Ardenne, the centre of which is Sedan; here fine black broadcloths and cassimeres are largely manufactured, as well as cloths for paletots and wool velvets.

3. The group of St. Isère, the centre of which is Vienne, which produce generally articles of low price for pantaloons, paletots, &c.

4. The group of High Rhine and Moselle, the centre of which is Biehwaller, which produces the fine-faced black cloths, called satins. The heavy stuffs for country use are made chiefly at Nancy.

5. The group of the Midi, comprising the towns of Carcassone, Mazamet, Saint Pons, and Bidarieux, which produce all the tissues of low price mentioned above.

The greater part of the wool employed in the card-wool industry comes from abroad; the ordinary French wools, from unimproved races, being used for the common cloths. Hand labor is almost everywhere replaced by power. Hand-weaving is employed only for the fabrication of articles, the designs of which, being subject to the caprices of fashion, are required to be in great variety, such as stuffs for pantaloons, waistcoats, and garments for ladies' wear. It is observed that power-labor, by reducing the price of the manufactured article, causes greater consumption, and employs more workmen. It is estimated that the manipulation of card-wool stuffs, and the general expenses, taking the winter and summer goods together, add one-third to the cost of the raw material. The number of workmen employed by patrons in manufacturing establishments, or mills, properly called, is estimated at nearly two-thirds of the total number; the rest work by hand at their own homes, but in both cases they generally work by the piece. The women employed in the card-wool industry comprise about two-fifths of all the laborers. The goods are generally sold directly to the great commercial houses of Paris and the departments, and these send commercial travellers through France and abroad to place their goods. The exportation of card-wool fabrics in 1865 was about 5,500,000 kilograms, of an approximate value of 71,000,000 francs. The annual production of these fabrics is reckoned at about 250,000,000 francs.

GENERAL FEATURES OF FRENCH INDUSTRY.

Before proceeding to a description of the several centres of manufacture it will be proper to refer to the general features of the French woollen industry. Some passages from "The Fleece and the Loom,"[1] published in 1866, may be appropriately quoted in this connection:

"In studying the characteristics of the French manufacturers, and the

[1] Address before the National Association of Wool Manufacturers, by John L. Hayes.

part they have taken in advancing the general progress of the woollen industry, and in adding to the means of consumption, we observe that they have not attained that economy of production which so eminently distinguishes the British manufacturers. Supplied with abundant labor, supported by cheap sustenance, the French manufacturers have been content to remain far behind the British and Americans in the substitution of machinery for human labor. But the tendency of machinery, as they think, is to give mediocrity to manufactured products; and the French aim at the utmost excellence in their works. The individual skill or handicraft of the workman is developed to the utmost extent. All machinery is rejected which will not surpass the manipulations of the hand. Spinning, the foundation of good textures, is carried by them to the utmost perfection. Yarns, spun from combed or carded wool by the rival nations, exhibited at the great London Exposition, were carried 10, 20, and even 30 numbers higher by French spinners with the same wool. They excel equally in ameliorating raw materials, in making them softer and more flexible. The French, in the textile arts, are creators; while the English are *exploiteurs*. The one nation invents new fabrics, new combinations of old materials, new styles and patterns, or what, in a word, are called French novelties. The other works up these ideas, copies, transforms, dilutes, and, above all, cheapens. Most other nations follow the English example, and our own is as yet no exception. To specify the contributions of inventive or creative genius of France to the woollen industry, we must class, first among the machines, the Jacquard, already referred to, whose wonderful products are seen in all figured textures; and next, the machinery for combing wool and also cotton, of Heilman, of Mulhouse, an invention which possesses interest, not only on account of its vast importance, but the circumstances of its origin. The most novel and valuable part of this machine, as stated by the inventor, which he had long unsuccessfully endeavored to obtain, was ultimately accomplished by carrying into mechanical operation a suggestion which occurred to him while watching his daughters combing their hair. He was at that time meditating on the hard fate of inventors generally, and the misfortunes which befell their families. This circumstance, says Mr. Woodcroft, being communicated to Mr. Elmore, of the Royal Academy, was embodied by him in a picture which was exhibited, and greatly admired, at the Royal Academy in 1862. We all practice or use French creations without suspecting their origin. Before 1834 the colors of all fulled cloths were uniform. At that time Mr. Bonjean, of Sedan, conceived the idea, to give beauty to the productions of his looms, of uniting in the same stuff different tints and figures. His thought was that the domain of production would be as illimitable as that of fantasy, which was the name given to his goods. He was the originator of the product and name of fancy cassimeres, by far the most important branch of our own cloth manufacture. The French, already skilled in making light gauzes of silk, first made *baréges* in 1818; a fab

rie with a weft of wool and warp of silk. The English imitated the fabric by substituting cotton for silk in the warp. In 1826 M. Jourdain first produced, at the establishment of Troixvilles, that invaluable fabric, *mousseline delaine*, made of fine wool, for printing. In 1831 the manufacture and printing of this tissue was fully developed. In 1838 he also created *challis*, made of a warp of silk organzin and a weft of fine wool. In 1833 first appeared at Paris, simultaneously introduced by three French houses, that fabric so appropriate for the consumption of the masses, the *mousseline delaine*, with cotton warps. The English adopted the manufacture in 1834–'35, and it prevails in every manufacturing nation. This fabric, which is unquestionably a French idea, has been an inestimable blessing. Its products are counted by millions of pieces, and it enables the most humble female to clothe herself more comfortably and becomingly, and as cheaply, with wool, as she could 30 years ago with cotton. In 1858 plain *baréges* were introduced, for printing. These had before been made of colored threads; at the same time *balsorine*, having the effect of alternate fabrics of cloth and gauze, was created in wool in imitation of a flaxen fabric. The *foulards*, with a warp of silk and weft of English combing, were introduced about this time at St. Denis. The fabric, however, most appreciated by female taste, and the most unrivalled of modern woollen textures, and the only one not degraded by imitation, is that beautiful material which derives its name from the fleece of which it is made, the French merino. This tissue was first made at Rheims, in 1801, by a workman named Dauphinot Pallotean. The invention, for which a patent was asked, whether successfully or not is not known, consisted solely in the adaptation of a peculiar type of wool, and not in the fabric. * * * * *

"The creative genius of the French is more conspicuous in their arts of design and color, as applied to all textile products. There is an unlimited application of these arts and a boundless field for novelties in the modern use of printed woollen goods. All the manufacturers of France, in producing new styles of fabric or figure, nourish their tastes by Parisian ideas, the inheritance of the ancient splendor of Versailles. Says M. Benoville: 'At Paris each consumer is a judge, and becomes a guide to the merchant and manufacturer. The Parisians appreciate only what is good, and consecrate only what is beautiful. The grisette as well as the *grande dame*, the artisan as well as the dandy, has received, and practices without knowing it, the traditions of art.' Although important commercial houses are now established for the sale of designs elaborated in this school, there is no manufacturer in Europe who scruples to copy French patterns. We have even so framed our patent laws that, while protecting all other foreign works of invention, we might appropriate with impunity the works of the Parisian pencil and pallet.

"Thus, by importation as well as imitation, all over the world, the true lovers of the beautiful, as well as 'the sophists, economists, and calculators,' whose advent, upon the fall of Maria Antoinette, is so patheti-

cally lamented by Burke, acknowledge France, so gracefully symbolized by Eugénie, the empress of taste and fashion."

CULTURE OF TASTE.

The modes in which taste is cultivated in France deserve study and imitation in this country. They are illustrated by the observations of Doctor Ure upon the habits of the silk weavers at Lyons.

"Among the weavers of the place, the children and everybody connected with devising patterns, much attention is devoted to everything in any way connected with the beautiful, either in figure or color. Weavers may be seen in their holiday leisure gathering flowers and grouping them in the most engaging combinations. They are continually suggesting new designs to their employers, and are thus the fruitful source of elegant patterns.

"There is hardly any considerable house in Lyons in which there is not a partner who owes his place in it to his success as an artist. The town of Lyons is so conscious of the value of such studies that it contributes 20,000 francs per annum to the government establishment of the School of Arts, which takes charge of every youth who shows an aptitude for drawing, or imitative design of any kind, applicable to manufactures. Hence all the eminent painters, sculptors, even botanists and florists of Lyons, become eventually associated with the staple trade and devote to it their happiest conceptions. In the principal school, that of St. Peter's, there are about 180 students, every one of whom receives from the town a gratuitous education in art for five years, comprehending delineations in anatomy, botany, architecture, and loom pattern drawing. A botanical garden is attached to the school. The government allows 3,100 francs a year to the school of Lyons. The school supplies the scholars with everything but the materials, and allows them to reap the benefit of their works. Their professor of painting is a man of distinguished talent well known to connoisseurs.

"The French manufacturer justly considers that his pattern is the principal element of his success in trade, for the mere handiwork of weaving is a simple affair with the improved Jacquard loom. He therefore visits the school and picks out the boy who promises, by taste and invention, to suit his purpose the best. He invites him to his home, boards him, and gives him a small salary, to be gradually advanced. One gentleman told Doctor Bowring that he had three such youths in his employment, to the youngest of whom he gave 1,000 francs, or £40, per annum. After three or four years, if the young artist's success be remarkable, he may have his salary raised to double or treble that sum; and when his reputation is once established, he is sure of the offer of a partnership. Such is the general history of many of the schoolboys of Lyons. Even the French weaver, who earns only 15*d.* or 20*d.* a day, prides himself upon his knowledge of design; he will turn over several hundred patterns in his possession and descant on their relative merits,

seldom erring far in predicting the success of any new style. By this disposition the minds of the silk weavers in France become elevated and refined, instead of being stultified in gin shops, as those of the English too frequently are. In flower patterns the French designs are remarkably free from incongruities, being copied from nature with scientific precision. They supply taste to the whole world, in proportion to the extent of their exportations, which amount to 110,000,000 out of 140,000,000. In the Lyons school collections of silk fabrics may be studied, extending over a period of 4,000 years, with explanations of the modes in which every pattern was produced, from the rude silk of the Egyptian mummies to figured webs of the last year."

It is worthy of mention that the Chamber of Commerce of Lyons solicited and obtained from the French government permission for M. Chevreuil, the eminent director of the dye works of the Gobelins, to lecture to the artisans of Lyons upon the "Laws of the simultaneous contrast of colors," which he discovered and has so ably elucidated—laws which, once demonstrated, become a means of assorting colors so as to obtain their best possible effect, and make the principles of taste which govern the arrangement of colors as definite as the harmonies of music.

DYEING IN FRANCE AND CONTRIBUTIONS OF MODERN SCIENCE TO THE ART.

There would be but a limited field for the exercise of taste in the textile industry without the art of dyeing, which is to tissues what the summer's sun is to the landscape, the source of all which delights the eye in light and color. While admiring the splendors of impression and color displayed upon the fabrics of the present day, we should not forget how largely they are due to the intelligence and science of the French statesmen and savans of former generations.

The great Colbert in establishing manufactures in France, made improvements in the art of dyeing the object of special care. He published in 1672 a set of regulations "for the dyeing of wools and the manufacture of wools of all colors," and showed that dyeing was an object deserving public attention from the additional value which it confers upon many of the articles of commerce. "If the manufactories of wool, silk, and thread are to be reckoned among those which contribute most to the support of commerce, dyeing," says Colbert, "which gives them that striking variety of color by which they resemble what is most beautiful in nature, may be considered as the soul of tissues, without which the body could scarcely exist. Wool and silk, the natural color of which rather indicates the rudeness of former ages than the genius and improvement of the present, would be in no great request if the art of dyeing did not furnish attractions which recommend them even to the most barbarous nations. All visible objects are distinguished and recommended by colors, but for the purposes of commerce it is not only necessary that they should be beautiful, but that they should be good,

and that their duration should equal that of the material which they adorn."

These ideas bore fruit in the magnificent tapestries of the Gobelins manufactory, and more usefully in the famous black cloths of Sedan, both of which are due to this great statesman. The art of dyeing was also during his time applied to printing cottons. The industry of calico printing was founded in Holland during the 17th century by a native of France. It was planted by a Frenchman in 1690 upon the banks of the Thames, and established about that time by a French refugee at Neufchatel, from whence it was brought back again to the country of its nativity by the celebrated Oberkampf. The regulation of the art of dyeing continued after the time of Colbert to be an object of governmental care in France; and Hellot, Macquer, and Berthollet, all eminent chemists, were successively appointed to superintend the practice of dyeing and to cultivate the branches of science which had a tendency to promote the progress of the art. Each of these chemists left practical treatises upon dyeing, of great value. The work of Berthollet, published in 1791, became the standard book of the age, since it contained not only a detailed account of the practical operations of the art, but theoretical views of the principles upon which it was founded. These works, and that of Chaptal, who while occupying the office of minister of the interior, had become interested in the art, contained nearly all that was valuable respecting the art of dyeing in any language at the close of the last century. The best informed Englishmen of that period, such as Mr. Anderson, author of the "History of Commerce," and Mr. Howe, author of an essay on bleaching, did not hesitate to admit the superiority in brilliancy of color of the articles of French manufacture of this period, and to attribute it to the fostering care of the government.

The Exposition of Paris has called forth a beautiful study on the dyeing and printing of fabrics from M. De Kaeppilin. This treatise, the more elaborate work of M. Schutzenberger, published in 1867, under the auspices of the Industrial Society of Mulhouse, and the admirable report of Dr. Hoffman, president of the Chemical Society of London, published in 1863, furnish ample information as to the progress of the art in this century. A signal step in the advancement of this art was the discovery by the celebrated Vauquelin, in the early part of the present century, of the metal chromium the compounds of which have since had so many industrial applications, especially in the printing of mousselines and calicoes, as in the chromate of lead first prepared for printing cottons by Lassarque in 1819, and the oxide of chromium combined with arsenious acid to form green, applied by Courez. In 1810 Loffet introduced the process of fixing colors by means of steam to the printing of cashmere shawls, thus dispensing with the immersion of the fabrics in a bath of tincture. During the years 1837, '38, '39, '40, and '45, the beautiful discovery of Loffet received its most remarkable application in the fabrication of mousselines of wool, and wool with warps of cotton, by means of colors fixed by steam. It was

this application which gave the vast extension to the manufacture of printed woollen tissues, which constitute at present the most important part of the combed-wool industry of France, and the only branch which has been successfully pursued in this country. The application of steam colors to cotton fabrics was greatly advanced by the discovery of stannate of soda by Mr. Steiner, which enables the colorist to give to the steam print a solidity and lustre in which it was wanting before.

Of the modern discoveries in chemistry there is none more brilliant than that of the cheap production of ultra-marine, which was effected by Guimet in 1828, the right being secured to him by patent. This material, affording a blue color of surpassing intensity and purity, was formerly supplied by levigating the powder of the mineral *lapis lazuli*, obtained in small masses from Siberia. Its value in the arts was 125 francs an ounce, more than its weight in gold. The artificial ultra-marine is produced by combining the same chemical substances, the soda, silica, sulphur, and alumina which are found in the lapis lazuli, and is equal in brilliancy of color to the natural ultra-marine. Its cost has been reduced from 6,000 francs to 6 francs the kilogram. The first impressions were made with this color, fixed by albumen upon mousselines delaine, in 1834, and in the richest fabrics of France this beautiful color replaces the duller tints formed by indigo and prussian blue, the latter dye having been fixed upon woollen tissues as a color of impression in 1836.

We must not pass over another series of inventions, although they have special relations to the printing of cotton fabrics. For the printing of cottons madder is by far the most important material on account of the permanency of its dyes. The extensive demand for this material and the desirableness of obtaining brighter tints has made it an object of the highest importance to free the coloring principle of the madder root from extraneous matters. The French chemical manufacturers have achieved remarkable results in this direction. In 1826 MM. Robiquet and Collin discovered in the madder root the principle *alizarine*, formerly a rose-colored dye, which the English afterwards introduced as a commercial article under the name of *pincoffine*. In 1828 purpurine, also derived from madder, was indicated by the same chemist as a chemical species distinct from alizarine. It furnishes a more vivid red than the alizarine, and is now prepared commercially. Since the period last mentioned the coloring matter of madder has been concentrated in the form known as garancine and flowers of madder. These materials are prepared commercially in France in vast quantities, their use proving greatly advantageous, both in respect to economy and improvement of color. The dyeing powers of purpurine and alizarine are remarkable, that of purpurine being equal to forty or fifty times the same quantity of madder, and that of alizarine to that of thirty-eight times that of madder. These new substances have been found valuable in dyeing wool. Wool mordanted with alum and cream of tartar gives, with purpurine, a brilliant crimson

red, and mordanted with tartar and a solution of tin gives, with purpurine, a scarlet almost as fine as that from cochineal.

The advantages resulting from the recent improvements by which the coloring matter of madder is obtained in a purer and more concentrated form will be rendered more obvious by a brief statement of the usual processes in printing. These may be divided into three principal classes: First, where the colors are fixed without a mordant, as in dyeing blue with indigo, either of a uniform tint, or where the whites are reserved by an application which prevents the contact of the dye upon the parts to remain uncolored. Second, where mordants are first printed upon the tissues, which are afterwards subjected to subsequent operations of tinctures, as by immersion in the dyeing liquid, &c. This process until very recently has been necessary for all madder dyes. Third, where the mordants and coloring matters are previously combined together to form the color to be impressed, which is called a "color of application." In this last class of processes the printed tissues are suspended in a vessel filled with steam from boiling water, which produces the same effect as dying by immersion in a liquid bath, the colors combining directly with the fibres of the tissues. By means of the steaming process, the operator can print and fix at once an indefinite number of colors, and terminate by the two or three operations of printing, fixing, and washing a work, which formerly required many weeks when accomplished by the process of dyeing after the printing with mordants; almost all the coloring materials known could be fixed by the third process upon tissues of wool, silk, or cotton. The coloring matter of madder alone has not been isolated in sufficiently advantageous conditions of assimilation, that the process of fixing by steam could be applied to it. The discovery of the different purifications of madder has placed it in the power of the printer of tissues to apply the expeditious process of steam printing to the most permanent and useful of all vegetable colors. The most important use of madder as a color of application has been achieved only within a few months. Very beautiful fabrics printed by this process at two establishments, one in France and the other in Bohemia, were displayed at the Exposition. M. De Kaeppilin, referring to these fabrics, says, "It is evident that the long and difficult operations required for fixing the vegetable coloring material on tissues are now quite simplified, and that the new manner of fixing the coloring material of madder, all prepared and combined with the different mordants, being allied with the beautiful and simple fabrication of colors from aniline, will achieve for the industry of printing tissues its most beautiful conquest. Instead of the ancient steam colors, which in respect to solidity left much to desire, the madder colors, married as it were with the brilliant colors derived from coal tar and the solid and resistant mineral colors, like ultramarine and chrome green of Guignet, will replace the fugitive colors of the dye woods. The fabrication will be more perfect, and will reunite solidity and brilliancy of colors with the delicacy of execution which can be obtained only by machines which print mechanically."

It has long been known that certain species of lichen exposed simultaneously to the action of ammonia, moisture, and a moderate temperature, gradually acquire a deep purple color, and the property of dyeing wool and silk with pure and brilliant tints. The pasty and woody mass containing the coloring matter is known as cudbear. The coloring matter extracted by means of an alkali and separated from the woody portions is known as archil or *orseille*. A new kind of archil was introduced in 1856 by MM. Guinon, Marnas, and Bonnet, under the name of French purple, in the form of lime lake. It furnishes very fine and pure mauve and dahlia tints upon silk and wool without mordants, and mixes easily with other coloring matters, such as ultramarine, indigo, carmine, cochineal, aniline red, &c., producing the most varied and delicate tints. The manufacture of French purple, although at one time extensively prosecuted, has been greatly diminished in importance by the competition of the coal-tar purple.

In 1854 MM. Hartmann and Cordillet succeeded in fixing upon fabrics the green coloring matter of leaves. In 1851 and 1852 the famous Chinese green, called *Lo-kao* was introduced. Subsequently M. Charven, of Lyons, obtained the coloring principle of the *Lo-kao* from a weed indigenous to Europe, the *Rhamnus catharticus*, for which he received a gold medal. The Chinese green was especially admired on account of the beautiful green shades which the fabrics dyed with it assumed in artificial light. MM. Guinon, Marnas, and Bonnet discovered the means of producing at less cost shades of green which preserve their character under artificial light by the use of Prussian blue with picric acid. It is a curious fact that, while the greens produced by indigo and picric acid appear blue in artificial light, the dyes produced by Prussian blue and picric acid appear green.

A remarkable and very beautiful amaranthine red was first commercially prepared from uric acid in 1856. This dye, called *murexide*, created a great sensation, but its use was of short duration, as a more vivid and more easily applied tint was about this time obtained from aniline, and the murexide was objectionable because the color, though unaffected by the sun, was destroyed by sulphurous fumes, as in the atmosphere of London, impregnated with sulphur from coal. This coloring material is peculiarly interesting from the circumstance that it is nearly identical in composition with the ancient purple derived from the murex. Professor Hoffman records, as he shared, the triumph which was felt in Liebig's laboratory when a few grains of this substance were first obtained in a state of purity, and the rapidity with which the scientific discovery was made practical in the arts. When the manufacture reached its culminating point, the weekly yield of murexide in one factory only amounted to no less than 12 cwt., a quantity in the production of which 12 tons of guano were consumed.

The long-sought-for rediscovery of the Tyrian dye was hardly attained before it was replaced by a product of modern science. The year

1856 was remarkable in the history of dyeing as the epoch of the most complete revolution of the art. It was the period of the practical discovery of the first aniline colors. The property which aniline, a product from the hydrocarbons of the coal series, possesses of forming colored compounds, was indicated by Runge in 1856. This indication was followed by the discovery by a young English chemist, named Perkins, of the means of preparing commercially from aniline a coloring substance of great intensity of hue and permanency, which is known in the arts as the "Perkins violet." This was almost immediately followed by the commercial preparation in France, by Verguin, of the aniline red. The extraordinary qualities of these products, the wonderful facility with which they could be applied to wool and silk, and the freshness and vividness of their hues, stimulated the scientific and practical chemists in France and England to search for new compounds from the same source, and to cheapen the production of those known. The most important scientific results were obtained by the English chemist Hoffman, who discovered and prepared the colorless rosaniline, a base from which all the reds, besides many other colors, may be formed, by different reagents. The colors derived from the hydrocarbons of the coal series are as various and as vivid as the hues of the flowers.

The aniline colors whose use in the arts has been fully established by practice, are:

1. The aniline, or Perkins violet, called also rosaline, indesine, mauve, aneleine, hamaline, and violene.
2. The aniline reds with a rosaline base, called also fuschine, azaleine, and magenta.
3. The blues of rosanaline, Lyons blue, blue *de lumiere*.
4. The rosaniline violets, different in hue from the Perkins violet.
5. Hoffman's violet.
6. Imperial dahlia.
7. Aniline green.

To these may be added an orange color, chrysaniline, and colors produced from the oxidation of aniline, but not directly applied; a green called emeraldine, a blue called azurine, and the intense aniline black, developed only on vegetable fibres.

The use of these colors gives a marked character to the dyed tissues of the present age. The great change effected by them was remarkably illustrated at the Exposition by a display of parallel series of wools dyed by the ancient, and the new or aniline processes. The aniline hues were predominant in the richly colored fabrics of the Exposition, and, adopting the figure of Colbert, that "color is the soul of tissues, without which the body could scarcely exist," we might say that these colors fix the *psychological* character of the fabrics of the present day. Among the wonders of modern science what is stranger than this, that the gigantic plants buried in the coal measures of the ancient world are made to bloom with all the tints of the primeval flowers, upon the tissues of modern industry?

Artistic reasons are not the only ones which have led to the prevailing use of the new dyes; economical reasons have had equal weight, especially in the woollen industry. One of the most remarkable characters of the coloring materials derived from aniline is the powerful affinity which they possess for materials of animal origin, or nitrogenized substances, and especially for wool, silk, albumen, gluten, and caseine. The affinity for these substances is so great that there is no need of any mordant. In the application to vegetable tissues, such as cotton, it is only necessary to animalize the fibre with albumen. These colors may not only be applied with the greatest facility in dyeing by immersion, but add vastly to the economy of printing mousselines or calicos, as they may be used as "colors of application" in steam printing. Besides, all these colors are now sold commercially in a state of great purity, and very often in crystals. The colorist has rarely anything more to do than to dissolve the product in a suitable vehicle, and to put it in presence of the fibre, in the conditions in which it can adhere, which for wool and silk are extremely simple.

The great problem in the art which science has now to resolve is to give more stability of color to these magnificent products of modern chemistry. The chemist who has furnished many of the facts above given, M. De Kaeppilin, is hopeful that this will be accomplished. He says: "Some of these results have already been obtained; above all, upon tissues of wool and silk. It is evident that colors derived from archills, such as the violets and reds, are more fugitive than the Perkins violet or new violets from rosaniline of Pourier and Chappal; that the roses of safflower or cochineal are not more stable than the roses of aniline, and that aniline black is not only superior to all other blacks, but that it is wholly unalterable and of complete stability upon tissues of cotton."

Before closing this imperfect review of the relation of chemical arts to the woollen industry, it is due to American science to observe that the name of the lamented Dr. Dana, of Lowell, is most honorably mentioned by French savans among those who have rendered important service to the art of dyeing and printing tissues. The credit is awarded to him of the introduction of lime in the operation of bleaching for the purpose of saponifying the fatty matter contained in the crude tissues. He thus completed the great discovery of Berthollet of the bleaching qualities of chlorine.

CHARACTERISTIC CENTRES IN FRANCE.

The highly philosophical work entitled "La Laine," being one of a series of studies upon the régime of manufactures, by Louis Reyband, member of the Institute, accompanied by numerous statistical documents, published in 1867, together with the treatise on the industry of card-wool, by M. Randonig, and the more elaborate treatise upon the industry of combed wool, by M. Benoville, published in 1854, furnish reliable data for special descriptions of the most important centres of the woollen

industry in France. The former work is the principal authority for the statements which follow.

ELBEUF.

In the woollen industry Normandy stands in the first rank among the present provinces of France. The genius and taste of the Norman race are the inheritance of a remote antiquity. The country of Caux and the valley of Ange were renowned for their fabrics during the period of the Roman empire, and furnished plaid cloths, woven in squares, the original types of the Scotch tartans, for clothing the Roman armies. There are traces of this industry at Elbeuf in the seventh century, and of considerable activity in the 13th. The industry was arrested by the English invasion of the 14th century, and the inaction was prolonged by the wars of the Froud. In the 17th century the manufacture of cloth was revived through privileges obtained from the founder of the French protective system, Colbert, and became established upon their present firm foundation through the industrial war which Napoleon waged against England by means of the continental blockade. It is not strange, therefore, to find at Elbeuf one of the most characteristic centres of the woollen industry in the world. The whole life of Elbeuf is its card-wool manufacture, which supports a population of 19,000, and, including that which is floating, a population of 30,000, and furnishes a product of 85,000,000 francs. Elbeuf ranks first of all towns in this manufacture in the fabrication of novelties or fancy fabrics of clothing wool. Other towns can rival it in the strength of goods and cheapness of price, but in everything requiring ornament, delicacy of tints, taste, and elegance in card-wool fabrics Elbeuf stands above all rivals. It is the point above all others where the American manufacturers and designers can acquire that taste which is unattainable without the study of models. The customers of Elbeuf are the principal tailors and great commission-houses of Paris, and they are usually the judges who determine whether a novelty shall be a success. Cases are mentioned where a manufacturer has distributed 40,000 francs' worth of patterns of a single fabric into the hands of commercial travellers, thus sowing that he may reap. The harvest is sometimes enormous. The cases are not infrequent where a happy chance, or a fugitive fancy, has founded a fortune. In the competition of novelties, none of which last more than a season, but which establish modes which extend like the wave of a tide all over the world of fashion, the tide being at its height in a distant province when it has ebbed at its source, there is a novelty and activity which impresses itself upon the physiognomy of the inhabitants of the town.

In the manufacture of novelties and fancy stuffs the designers perform a very important part; for the success of a season depends upon their inspiration. A good designer makes his own terms, and the manufacturers usually secure their services by large rewards. In many cases they have an interest in the sale of their designs, and sometimes become

partners in houses whose fortunes are made by their taste. The design of a fabric is not difficult, and requires no great preparatory study, as it is only necessary to combine some hues and colors to produce a certain harmony of effects. It is a work which it would seem any one could do, and yet it requires a peculiar gift. There is a precise point which the designer must reach, and not overstep; a shade which will be accepted when no other would find favor; a contrast which will be agreeable on one stuff and displease on another; and a management of mere nothings, or little accidents, which appear to have no signification, but which make success or failure. The French designer is restrained by the public sentiment of his country, to which he must never do violence, which requires elegance without affectation, and, in the midst of perpetual caprices, demands what is natural in everything that is original.

Next to the designers rank the workmen, who act as their interpreters, by translating the design upon the loom or the Jacquard cards, and arrange the warps and harnesses so that the weaver may perform the mechanical work. These workmen are all highly paid. Another class of workmen are the *echantilleurs*, or men who execute the first specimen pattern, by which the probable effect of a design is determined. These men are required to be absolutely trustworthy, especially when many specimen patterns are made to secure orders for goods. Some of the large establishments keep their workmen of this class in the utmost seclusion. There are some establishments which make the furnishing of specimen patterns for the smaller establishments their sole business.

There is one peculiar feature in the woollen industry of Elbeuf which has greatly stimulated its extension. It is the facilities for credit which are afforded to the manufacturer. Cost of capital is the obstacle of all others against which the woollen manufacturer has chiefly to contend, on account of the dearness of raw material. Usually the wool manufacturer obtains his raw material only for cash, or on short credit. At Elbeuf there are several houses which are at the same time banks and warehouses, and which give credit for all operations of trade; but the peculiarity of these houses at Elbeuf is that they sell the raw material not for notes payable at a fixed time, but on an account current. Any manufacturer who wants a lot of wool can select it, fix his price, and carry it away. The payment is almost discretionary with the purchaser. Every facility is given for payment, which may be made from time to time, as the manufacturer gets his returns. The account-current is the mirror in which the manufacturer has reflected the state of his affairs. This system, under which personal character is the gauge of solvency, has given great vitality to the business of Elbeuf. Alongside of the hereditary houses of this ancient town there are great numbers of children of their works, who, rising from workmen to overseers, have finally exchanged their chevrons for epaulettes. It is this infusion of new blood which preserves the characteristic vitality and freshness of the woollen industry of Elbeuf. It is unnecessary to say how desirable it is that this system should be imitated

here. It offers a means of improving the condition of the workmen certainly not less practical than the system of co-operation which is now being so earnestly recommended to public favor, but which does not seem of easy application in the textile industry.

A characteristic feature in the manufacturing system of Elbeuf is that while there are many complete establishments where wool enters in the fleece and issues in finished fabrics, the dominant industry of this town is the application of distinct processes of manufacture, single establishments being devoted wholly to preparing wool, others to carding, or spinning, or dyeing. Each of the processes of washing the wool, drying, burring, carding, supplying patterns, weaving, spinning, fulling, gigging, pressing, and packing, constitute separate industries. There are 20 great dyeing establishments, 12 for spinning, 50 for working up waste, many drying establishments, &c., and many houses which are commercial rather than industrial, uniting these different industries to produce fabrics which they put in the market. This system is very advantageous to the small fabricant who has but little capital at command. He can choose for each kind of operation the special establishment where it is done best, and at the least expense. The advantages are so marked that many wealthy houses avail themselves of it. It is well worthy of consideration whether this system could not be advantageously introduced in some of the great manufacturing centres in this country. It prevails here to a limited extent, as for spinning yarns. It has recently been applied to washing and preparing wool. It may be found, as has been the experience at Elbeuf, that where both systems, that of concentration and dispersion of labor, prevail, it is advantageous to the general advancement of the manufacturing industry.

All the regions where the woollen industry is pursued in France have a comparatively improved aspect, showing the increase of wealth which manufactures have added to the national resources of the soil. The cottages with only a single room are less frequent, and here and there may be seen the dwelling of a workman indicating a comfort and decency of living which is rare among the peasantry of France. Yet the condition of the common workmen at Elbeuf, judged by the American standard, is far from being easy or enviable. The whole number working within and without the town is estimated at 24,000.

The following statement of their average wages is derived from statistical documents prepared since 1864 by a former mayor and president of the Chamber of Commerce of Elbeuf:

For children, limited to 8 hours' work, 75 centimes to 1 franc 10 centimes, (equal to 15 cents to 22 cents;) for those working 12 hours, 1 franc 25 centimes to 1 franc 50 centimes, (equal to 25 cents to 30 cents:) youths from 16 to 18 years old, 1 franc 50 centimes, (equal to 30 cents;) workmen by the day, 2 francs to 3 francs, (equal to 40 cents to 60 cents;) men working by the task or piece, 3 francs to 4 francs 50 centimes, (equal to 60 cents to 90 cents)—these are more numerous than the day workmen;

workmen working by the day, 1 franc 10 centimes to 2 francs, (equal to 22 cents to 40 cents;) women working by the piece, 1 franc 75 centimes to 2 francs 50 centimes, (equal to 35 cents to 50 cents.) It is estimated by M. Reybaud that in the most ordinary cases the yearly wages for men are 750 francs, ($150;) for women, 525 francs, ($105;) for young men and girls, 375 francs, ($75;) for children, 225 francs, ($45.)

The prices of food and lodging are relatively high at Elbeuf. Meat costs 1 franc 60 centimes the kilogram, (or 17 cents per pound,) and potatoes 5 to 6 francs the bushel. The food of the men, such only as serves merely to support life, costs per year 350 francs, ($70;) house rent, 125 francs, ($25;) other necessary expenses for maintenance, 160 to 180 francs, ($32 to $36.) On this scale of living the workman is able to eat meat only on Sunday, the only animal food on weekdays being salt-herring or mackerel; and even with this meagre sustenance there is hardly any margin for saving or amusement. The invariable consequence of the reduction of the compensation of labor to the bare necessities of life, the system which free trade demands to have applied in this country, is shown at Elbeuf in the moral degradation of the working classes. The consumption of alcohol at the drinking shops is, for the whole population of the town, 16 litres (28 pints) per head, or, deducting the women and the children, 50 to 60 litres (from 80 to 100 pints) for the average consumption of the frequenters of the cabaret. "On the other hand," says M. Reybaud, "the women give themselves up to other tastes. Their toilettes consume their savings, and their scruples are not in general very vivid as to the means of increasing the same when it is insufficient." One proof of the general looseness of morals among the whole people is the custom which prevails among men and women to resort for the night's lodging to vast dormitories, where both sexes are mingled in a common, unlighted apartment, without partitions, and wholly free from surveillance or restraint. Another evidence of the low morality of the workmen is the common practice among the hand weavers to sequestrate a portion of the yarn delivered to them to be woven. It is estimated that some workmen by this means add a quarter to a third to their stipulated pay. It is thus that labor revenges itself for insufficient wages.

In looking at the woollen industry at this important centre, as a whole, we find this industry, viewed merely as an art, in the highest state of perfection, and presenting in taste and processes everything worthy of imitation; but, while art thrives, and employers are enriched, labor is degraded, morality is depressed, and humanity suffers. When we see the benevolent men of France candidly publishing such facts as are stated above, and acknowledging and deploring the evils of the social system inherited from the old feudalism of Europe, shall we not submit to the slight sacrifice demanded to reconcile, in this country, what Europe has failed to do—progress in the industrial arts, with a just compensation to labor?

SEDAN.

The woollen industry of Sedan, although of the same general character as that which flourishes with greater prosperity at Elbeuf, deserves special notice from the celebrity of its products. The manufacture of cloths was pursued by isolated workmen from Flanders, when Colbert applied his vast energies to give a national character to the manufactures of France. He gave to Abbeville, Van Robais, a legacy chronicled by Thiers as more valuable to France than the conquests of Louis XVI, which struck down the Spanish power, and to Sedan, Nicholas Cadeau, a master in his art, who soon converted the modest production of the hamlets into an urban manufacture. Establishments for dyeing, carding, and dressing were brought within the walls and became protected by the cannon of the citadel. That which, above all, promoted the success of the manufactures of this city after their first establishment, was the fidelity with which its cloths were fabricated; the marks of its fabrics were, like the marks on Swedish iron, or the tower mark on English silver, infallible seals of excellence. The black and blue cloths preserved their reputation from generation to generation, and many houses of Sedan are still faithful to the ancient traditions, as proved by one gold medal and eight silver medals, and none of less degree, awarded at the Exposition.

It is singular that an invention originating in Sedan should have changed the ancient system which made excellence in material and fabrication the essential qualities of cloths. This invention was that of the modern styles of fancy cloths, and was due to one of those happy chances which often lead to great results when improved by intelligence. M. Bonjean, an educated manufacturer, one day found among his products a piece of goods which was defective in body on account of the dead wool of which it was fabricated. It occurred to him that he could give body to the wool by incorporating some fibres of silk in the warp. Upon combining the wool with the silk he found that the latter was not incorporated in the fabric, but made a distinct design upon the cloth. Improving upon the idea here suggested by using the Jacquard loom, he finished a fabric and sent it to a leading tailor at Paris. To his astonishment he had an immediate order for more goods of the same styles; still more variety was given to the fabrics, and the stuffs received the name of the Bonjean patterns. This was the origin of the fancy cassimeres, and other stuffs, which now comprise three-quarters of the production of card-wool goods, but which, unhappily for Sedan, built up the city of Elbeuf, the most formidable of its rivals.

Leaving the consideration of the technical for that of the social aspects of the industry at Sedan, we are interested in observing the superior morality of the workmen of this city, which is partly attributed to a smaller population, as compared to other manufacturing cities of France, but mainly to most honorable efforts on the part of the manufacturing employers.

The increased use of strong alcoholic drinks in consequence of the dearness of the wines, has caused drunkenness to become a prevailing evil among the manufacturing population of France. "For the first time in the course of my travels," says Mr. Reyband, "I have found at Sedan a population which was able to defend itself against drunkenness. The first honor is due to the chief of the manufacturing houses. By a concert which should be taken for an example, they have closed the doors of their ateliers against workmen with whom this vice was notorious, who themselves consent to this exclusion. The strife has been a long one, and with any other population, perhaps, the reform would not have succeeded. At Sedan it has had full success: acting first upon those less hardened, it has ended by reclaiming or improving the most obdurate. Towards those who, with the best intentions, would occasionally yield to temptation, they have shown indulgence, admitting them to the benefit of successive amendments; provided it was recognized that the cases were less frequent and less grave, their presence in the mill was tolerated. The condition was that they should make a sincere confession, or that the wife, the party so deeply interested, should ask favor for the husband's delinquency. The results of this reform are exhibited by the statement given of the habits of the workmen of Sedan by a former member of the assembly: 'The working population are very regular. The life in the family is the rule. The religious sentiment prevails in the mass and manifests itself in acts. The workmen do not frequent the cabaret on Sunday. They pass the day with their wives and children in the little garden which is the object of their ambition. Education is spreading every day; a man of 30 years who cannot read and write is a rare exception.'" The economy produced by these habits, and cheapness of food and lodging, enable the workmen to sustain themselves upon the small wages; which are, for spinners working by the piece, from 3 francs to 5 francs 50 centimes (60 cents to $1 10) per day of 12 hours. The women, spinning by the piece, earn 1 franc 50 centimes (30 cents) per day. The weavers, working by the piece, can earn 4 francs (80 cents) per day. The ordinary workmen receive 20 centimes (4 cents) per hour, or 2 francs 40 centimes (48 cents) per day. The women average 1 franc 20 centimes, (24 cents,) and children 75 centimes (15 cents) per day. The absolutely necessary expenses of living of a single workman earning 750 francs ($150) a year are stated at 661 francs, ($132 20;) being for food and lodging, 531 francs, ($106 20;) tobacco, 20 francs, ($4;) washing and general expenses, clothing, &c., 100 francs, ($20;) leaving the pittance of 89 francs ($17 80) for luxuries and savings. It is supposed in the above estimate that the workman, as is the usual practice, eats animal food once a day.

REGION DU MIDI.

The region of the middle of France comprises the third important centre of the card-wool industry of that country, but contrasting strongly

in its character with that of the districts before described. Its principal points are Lodève, Mazamet, and Bedarieux, while there are many less important localities. The common character of the production of this group, Mazamet only being excepted, is its adaptation to popular consumption. The foundation of the manufacture consists in the fabrication of strong cloths for workmen and army use, recommending themselves rather by their serviceableness than their appearance. A noticeable feature of the woollen industry of this group is, that the goods for common use are not trashy imitations of showy fabrics, but pretend to be no more than they are, common but serviceable goods. The manufacturers of this group supply nearly all the cloths consumed in the French army. The government demands only two conditions, a moderate price and faithfulness in execution. The rigid requirements of the government cause the most severe scrutiny on the part of the manufacturer, and have cultivated honesty of fabrication among the workmen. The absolute reliability with respect to these fabrics has opened a very important trade in cloths with the stationary people of the east, this trade having been established some generations ago.

Bedarieux, with a population of 9,000 souls, has 5,000 woollen workmen and as many more in the environs. The goods are manufactured principally with reference to exportation; through the means of commercial houses at Marseilles it sends its products to the markets of the Levant, or the French possessions in Africa and often to India. In this trade certain conditions have to be scrupulously observed to maintain the honor of the marks upon the cloths and guard the confidence of the eastern customers. For example: for the Levant there are required two sorts of cloths, the stamboul, which is a heavy cloth, and the mahont, which is a light cloth. The weight of the stuff must correspond exactly to the denomination assigned to it. For the army cloths 40 kilograms of wool give regularly 43 metres of stuff. For the cloths destined for the Levant the proportions are lowered. The stamboul, which is used for cloaks, requires only 44 kilograms of wool for 50 metres of cloth. The mahont requires 37 kilograms of wool for 60 metres of stuff, the price and quality decreasing in the ratio of the quantity of material employed. In the east the stuffs are both measured and weighed, and the goods are not received unless the measure and weight conform. With the fixed habits of the east the consumption of these goods is constant and regular. Here is a case where an important trade supplying all the armies of France, and an immense and increasing population at the east, has been established for generations mainly upon the commercial honor of the manufacturer. Our former trade with the east in brown drillings is a similar example.

The manufacturers of this group are not wholly limited to the specialties above mentioned Bedarieux has almost the monopoly of cloth for caps, of which it sends forth, principally to Paris, 250,000 pieces a year. Mazamet, a town in this group, through the enterprise of a single manu-

facturer, M. Houles, has risen in half a century from an obscure hamlet to a town of 12,000 inhabitants, of which there are 5,000 workmen, while there are as many more in the environs. Mazamet has entered into competition with Elbeuf in articles of novelty; its products, which now reach a value of 14,000,000 of francs, have made their way into the market of Paris and even of London.

A pleasing feature in the industry at Mazamet is the establishment of special workrooms for workwomen with nursing infants. Ordinarily the workwomen are prevented by their confinement in the mills from nursing their young children, as the women cannot leave the mill without losing their places. They ordinarily relieve themselves from this care by intrusting their infants to hired nurses. This is both a privation and an expense, the latter being equal to half the wages of the woman. At Mazamet a special workroom is provided for mothers with nursing children. The women are employed in very simple work, such as the sorting of wool or winding yarn upon bobbins, and can continue their labor while exercising their maternal duties. All access to this workshop nursery is prohibited to other workmen. The wages of the women are reduced in proportion to their labor, but all things considered, they gain greatly by this arrangement. It is refreshing, amidst the indifference to the condition of the laborer so prevalent in Europe, to see in an industrial experiment the expression, in this touching form, of a sentiment of humanity.

Within this group there is one establishment quite remarkable for the original manner in which it has been sought to combine industrial prosperity with the social amelioration of the workmen. The establishment of Villeneuvette bears the title of a royal manufacture, it being one of those founded by Colbert. Although under private proprietorship, it is exclusively devoted to the fabrication of cloths for the army. It preserves in many respects the features of a military post. It is surmounted by battlemented walls, the drum beats the reveille and tattoo, and the drawbridge is raised at night. The whole town is under the proprietorship of the establishment, and residence is permitted to no stranger who refuses to conform to the usages of the place. The mayor and officers of the municipality are workmen, elected by the workmen themselves, and there have been but four mayors since the time of the first empire. The workmen submit cheerfully to the military discipline which they have imposed themselves. The proprietors pay the best wages in the district; they contribute to the schools, at which attendance is compulsory, and to the common fund for the relief of the sick and aged, and provide flour and fuel at cost prices. Games of chance are prohibited; drunkenness is punished by exclusion. There is but a single cabaret, which is closed at 9 o'clock. In the course of 30 years there has been but one illegitimate birth. The people of this community have invariably kept aloof from political agitations; and when, in revolutionary times, bands of workmen of the surrounding country have scoured it

in arms, the workmen of Villeneuvette have excluded access by raising their drawbridge and manning their ramparts.

The average wages for labor in this group are less even than in the districts of Elbeuf and Sedan. The average day's wages are stated to be, for men, 2 francs 25 centimes, (45 cents;) for women, 1 franc 25 centimes, (25 cents;) and for children, 50 centimes, (10 cents.) This would give to a family of a man and wife with two children, all at work, 1,350 francs ($270) per year. It is estimated that the food per head costs, for a man, 75 centimes, (15 cents;) for a woman, 65 centimes, (13 cents;) and for a child, 50 centimes, (10 cents.) This for a family, as above, would be an expense of about 900 francs, ($180.) To this is to be added lodging, 100 francs, ($20;) clothing and other necessary expenses, 250 francs, ($50,) making a total expense of 1,250 francs, ($250;) and leaving a nominal surplus of 100 francs, ($20.) These receipts are possible only when all the family are at work. Thus, under the most favorable circumstances and without accident or sickness, all that a family of four persons can hope to secure for saving or luxuries is $20 a year.

RHEIMS.

We come now to the great centres of the combing-wool industry of France, far surpassing in importance that of card wool, already passed in review. To the agriculturist and the manufacturer, the city of Rheims—the most ancient seat of the Roman Catholic faith and of some of its most splendid monuments of architecture—is more interesting as the seat of a complete revolution in a great branch of textile industry, effected through the introduction of an improved race of ovine animals. The fabrics of combed wool, for which Rheims was so celebrated in ages past, the says, serges, and tanimins have wholly disappeared since the Spanish blood has been introduced into the sheepfolds of Champagne.

In 1801 an obscure workman of this city, named Dauphinot Palloteau, first made from the soft and long wool of the Rambouillet sheep the most unrivalled of modern woollen textures—the French merino—which, from its softness and solidity, must always hold its place independently of the caprices of fashion. The manufacture was extended through the influence of the Baron Ternaux, the most celebrated of all the manufacturers of France of his time, who founded at Rheims one of his many manufactories.

This fabrication of merinos constitutes at present the most important part of industry at Rheims, no cotton-warp fabrics being made, as at Roubaix. In 1786 the product of stuffs in this city was 94,615 pieces, of a value of 11,000,000 francs, employing 30,000 workmen and 12,000 looms.

In 1863 the value of fabrics produced was 80,000,000 francs. The number of hand looms employed was 19,000, occupying 38,000 workmen, and the number of power looms 1,300, occupying 900 workmen. For combing the wool there were 340 machines; for carding, 350 sets of machines, employing 5,000 workmen; and for spinning, 170,000 spindles,

with 2,400 workmen. The number of workmen in full activity was 55,000. The 30,000 workmen in 1786 produced a value of 377 francs per head. The 55,000 workmen in 1863 produced a value of 1,454 francs per head.

The most important change in the manipulation of this industry has been in the combing of wool. This was formerly effected by handicraft workmen, employed at their own homes. No labor in the woollen industry was so poorly paid, and the misery of the hand combers was proverbial. Their irregular wages did not exceed 1½ franc (30 cents) per day. Still the strife between the first imperfect machines and the hand combers was long and severe. The latter did not succumb until their wages were reduced to 80 centimes (16 cents) per day. Longer resistance was vain; the best workman could comb only 350 kilograms of wool per year, and a machine combs 20,000 kilograms. Of 10,000 hand combers at Rheims not one remains. For thirty years the genius of inventors has been applied to the perfection of combing machines. More than twenty inventions have added improvements in details. At Rheims there are at present in use three principal processes, that of Lister, of Heilman, and of Hubner; each of analogous merit, and each having its partisans. M. Holden has become the proprietor of all the principal processes or patent-rights, in addition to his own, holding 45 patents; 17 of his own and 18 by assignment. He thus nearly controls the combing of wool in France. He has put in operation three combing establishments at Rheims, St. Denis, and at Croix, near Roubaix. He is able to comb 16,000 kilograms a day. He employs 1,300 workmen, engines of 1,000-horse power, and 80 combing machines. There are no other establishments in Europe having these proportions, and so well able to resist competition.

For many years it was deemed impossible to weave merinos advantageously by power looms. Mechanical weaving is now accomplished with a perfection which leaves nothing to desire. A hand weaver can make 24 throws of the shuttle a day; the weaver on the power loom makes from 50 to 55 throws, and can easily tend two looms, so that his product is four times as much as the hand weaver's. There is, besides, more regularity in the product and less loss of material. The power loom is worked without muscular effort, hardly anything more being required than a little dexterity in mending the broken yarns. Women can do this work better than men, and in many establishments at Rheims women are exclusively employed under overseers. The superior advantages of the power loom open a sad prospect to the hand weavers of Rheims, of whom there are 38,000; and the means of averting the suffering from this class of workmen, in the inevitable change which must take place in the procedure of weaving, is a subject of most anxious consideration to the benevolent men of Rheims.

The precarious condition of so large a class of the workmen, and the gradual diminution of their wages, create a discontent which is ominous

of public calamities. The incendiaries of 1848 inflamed the workmen to such an extent, they destroyed the first establishment provided with power looms, and they look with an evil eye upon every one who introduces the new machines. It is admitted by the authorities of Rheims that an envious hatred of the rich prevails always among these workmen, and if they are tranquil at present, it is because they are "kept down by a strong government."

The manufacturers of Rheims regard the United States as the most important outlet for their goods. Our late war seriously affected their trade. They speak of the American crisis as having weighed so heavily upon it that the influence of the Anglo-French treaty upon commercial transactions was of comparatively little moment. The value of this trade is a sufficient inducement for us to transfer to our own shores the industry of fabricating merinos, which is dominant at Rheims. It can be adopted here with all its recent perfections, and without any of the drawbacks which weigh so heavily upon it in France. It is fitted for the skilled female labor already developed in our woollen mills. It will be favored by the character of the wools most advantageously grown here, and will greatly increase the production of sheep husbandry by creating an entirely new demand, and will introduce into more general use the softest and most beautiful of all fabrics for female use.

The effects of the struggle between the old and new system of manufacture is seen in the low average rate of wages in this city. The workmen employed upon power machines are comparatively well paid. The men spinning combed wool are paid from 3 francs 50 centimes (70 cents) to 4 francs (80 cents) per day, and the women from 1 franc 40 centimes (28 cents) to 1 franc 70 centimes, (34 cents.) The power-loom weavers earn from 2 francs 25 centimes (45 cents) to 3 francs (60 cents) per day, but the hand weavers, who compose the greater part of the working population, are reduced to wages which average only, for a man, 1 franc 50 centimes (30 cents) a day, for a woman 1 franc, (20 cents,) and for two children 75 centimes, (15 cents,) a total of 1,200 francs ($240) a year, for a family of four persons. The estimated expenses for the absolute necessities of living are 1,188 francs, ($237 60,) leaving a surplus above bare necessities of only 12 francs, or a little over two dollars. It is hardly necessary to say that this surplus is scarcely ever attained, and that poverty, debt, and moral degradation are the normal conditions of this industrial population.

CATEAU,

in the region of the north, furnishes an example of what may be done in the industry of merinos by adapting on a large scale the most recent processes, and making use of a raw material supplied from domestic sources. In 1818, M. Paturle selected the locality of the small town of Cateau, having a stream of water, affording a moderate hydraulic power and a laborious and intelligent population, already skilled in the

domestic manipulation of wool, as a site for the development of the idea of deriving the greatest possible benefit from the soft wool of the Spanish race, then commencing to abound in that region. He conceived that the utmost development of which the fibre of the new race was susceptible was in the fabrication of merinos, recently introduced at Rheims. From this idea there sprung up in the hands of MM. Paturle & Lupin, and of their successors, the most extensive manufactory of merinos in France, and the one which would serve best for a model in this country. The original machinery comprised only some instruments for combing and spinning, the weaving being operated on the hand-looms of the adjoining country. In the course of 30 years the machinery has been entirely renewed. The old water-wheels have made way for steam engines of 250 horse power, moving 60 combers, 40,000 spindles, and 600 power-looms. 2,000 workmen are employed directly in the mill, and the hand-weavers of the country furnish 4,000 auxiliaries, making a total of 6,000 workmen. The freight transported to and from the establishment amounts to 5,000 tons, and the value of the production is from 18 to 20 million francs, three-quarters of which is exported to all quarters of the world. The proprietors have earned their splendid prosperity by being faithful to the fabric first adopted. They have attained the utmost perfection in processes of manufacture by the employment of machines whose serviceableness had been verified, and have made their goods salable by a moderation of price without the sacrifice of quality. The Bradford delegates who visited Cateau, at the time of the Exposition, were "struck with astonishment at the cleanliness, order, and regularity of the vast establishment." Admirable schools are provided for children and adults attached to the works, and a public laundry and baths. The widow of the founder of the works has constructed and endowed a hospital provided with twenty beds for invalid workmen, as a monument for her husband. These foundations show that the generous sentiments of the proprietors have been among the elements of their prosperity. The best workmen earn at this establishment, where their condition is probably more favorable than anywhere else in France, from 3 francs 50 centimes (70 cents) to 4 francs (80 cents) per day, and the women at the power-looms from 1 franc 60 centimes (32 cents) to 2 francs, (40 cents.) It is estimated that with strict economy the head of a family can save from 60 to 150 francs, but, as has been said with regard to all such calculations, "we must distinguish that which is possible from that which is."

There are many other important centres and special localities of this industry which might be studied with profit, as that of the fabrication of merino shawls, or imitations of the Cashmere, distributed in the agricultural villages of the north in the arrondissements of Cambrai and Avesnes, and conducted under the direction of large houses in Paris; the spinning establishments of Fournies, where a mere hamlet has grown into a town of 4,000 inhabitants, employing 30,000 spindles, through the

co-operative association of workmen, the most signal example of the success of co-operative industry in France; the characteristic manufactures of Amiens, which produce annually more than 20,000,000 francs in value of the various fabrics from the hair of the Angora goat; but the space allotted in this paper for the manufactures of France must be reserved for the most important centre of the combing wool industry.

ROUBAIX.

Of all the manufacturing towns in France there is no one which in activity, enterprise, and rapidity of growth, compares with Roubaix, the "Bradford" of the empire. Situated upon the borders of French Flanders, its industry is a direct inheritance from the Flemish artisans, who in the middle ages were masters of the woollen industry of the world, and who supplied what Fuller calls that "treasury of foreigners" who enriched England by the introduction of the Flemish arts. A mere rural hamlet of two hundred families in 1469, overshadowed by the powerful town of Lisle, it was authorized by patent from Charles, Duke of Burgundy, to fabricate a limited class of woollen stuffs. Its powerful neighbor, Lisle, disputed this right, which was finally confirmed by the Emperor. Still, for three centuries an industrial war was carried on between the rival towns, which contributed greatly to the hardihood and enterprise of the victor, which Roubaix has finally become. The treaty of Aix-la-Chapelle in 1668, which united Flanders to France, by opening a larger market, gave a broader field to Flemish activity. The production of stuffs at Roubaix, which in 1612 was about 3,000 pieces, regularly increased until 1771, when the production was 38,000 pieces, occupying 40,500 laborers of both sexes, and representing a value of 2,987,500 francs. In 1786 the manufactures of Roubaix were sufficiently important to induce her to take the lead in resisting the consequences of the disastrous treaty of the Marquis de Vergennes, which admitted English goods into the French markets at nominal duties. All its inhabitants, men, women, and children, signed an act by which they bound themselves to wear nothing but the stuffs of France. This movement was followed in all the provinces, and the engagement was kept until the policy of 1786 was repealed and protection restored. True to her traditions, Roubaix, of all the cities of France, is most earnest in denunciation of the relaxation of the protective policy through the recent treaty with England. Within the present year, as appears by the Journal des Economistes, the consultative chambers of arts and manufactures of this and the adjoining city of Tourcoing have protested to the minister of commerce against the renewal of this treaty, declaring that the public fortune of Roubaix has suffered by the treaty to the extent of 200,000,000 of francs. The workmen of Roubaix have petitioned the Emperor to the same effect. The manufacturers of Lisle and Amiens have followed this movement, which is supported by the Moniteur Industrial of January 9, 1868, as follows: "15,000,000,000 this Anglo-

French alliance has cost us. Counting the results of the Belgium treaty, and of that which we have concluded with the Zollverein, and we have a total of 20,000,000. The treaties of commerce, the grand economical reform, the works which render illustrious the second half of the 19th century, have carried 20,000,000 to the debtor side of our national balance sheet."

The ancient device upon the municipal coat of arms of Roubaix embodies in two words the secret of all prosperity in manufactures as well as in common life, *Industrie et Probité*. Among the masters in textile industry in former times, a faithful fabrication of their stuffs was a point of honor as cherished as bravery in knights and virtue in women. The fabricants of Roubaix resisted the license in the fabrication of stuffs which was permitted after the revolution. They insisted that the ancient municipal regulations established to prevent frauds in manufacture should be preserved, and for forty years, through their chamber of commerce and council of Prudhommes, demanded of the government the restoration of the ancient restrictive regulations.

No city has derived a greater advantage from the freedom which it so earnestly resisted. For the last half century, the industrial life at Roubaix has been only one series of enterprises and happy experiments. Its dominant idea has been to adapt fabrics of luxury to popular consumption by combining the best taste and highest excellence with the lowest possible price. With this idea it has continually varied its materials and styles, combining wool with cotton, with silk, with mohair and flax, but in all the economies of production preserving a grace of decoration and sobriety and harmony of colors which takes from cheapness all its vulgarity. The Anglo-French treaty has compelled Roubaix to enter into direct competition with Bradford in the production of the light and fragile mixtures of wool or goats' hair with cotton warp, such as the bareges, the coburgs and mohairs, which have given such an immense development to the English worsted industry; but it appears, from the recent statements of its manufacturers, that its superior taste and invention have not enabled it to retain the control of the domestic market in conflict with the more powerful capital of England. The great establishments sustain comparison with their English rivals, whose methods, dimensions and machines they have adopted. The rapidity with which the town has advanced is without parallel in France. From a population of 5,000 souls in 1786, it has gone progressively to 10,000 in 1806, 15,000 in 1830, 25,000 in 1840, until it reached 55,000 in 1864, while its production of fabrics has risen from 3,000 to over 400,000 pieces, and the annual value of its manufactures has been increased from 3,000,000 or 4,000,000 to about 200,000,000 francs. This rapid growth is rivalled in Europe only at Bradford, which has been built up by a similar industry. It is remarkable that this marvellous prosperity is due in no respect to any advantages of nature or location. Roubaix had no water power, its natural streams being insufficient to supply the bleacheries;

and even in 1824, its only approach to Lisle was by a road impracticable in winter; the original source of its power was its native population, which had inherited the skill, arts, and enterprise of its Flemish ancestry. The ultimate source of this prosperity has been the happy idea of applying the native skill and taste, aided by the modern powers of steam and machinery, to furnishing in the cheapest and most attractive form the light fabrics for the largest and most important class of consumers, the women and children, and in satisfying the fickleness of female taste by constant variations of textures, styles and colors. The secret of the profitableness of this manufacture is, that the utmost amount of mere machine labor is given to the smallest possible amount of raw material. Sales and estimates of tariff duties in card-wool fabrics are made in a great measure by weight, having reference to the quantity of raw material. In combing-wool fabrics they are made by the yard. It is estimated that a single hoggett fleece from a Lincoln sheep weighing 20 pounds of a length of staple of 17 inches, such as has been sometimes exhibited in England, when used in manufacture to its utmost extent, with cotton, to fabricate the finest alpaca fabrics would suffice to make 16 pieces, or 672 yards, enough for 56 dresses. The same amount of wool made into cloth would not make suits for six men.

M. Benoville states that a careful calculation made at Roubaix in 1843 showed that there were consumed at that place in the manufacture of the class of fabrics in question, 4,536,168 kilograms of wool, of the value of 17,000,000 francs, averaging 3 francs 74 centimes the kilogram. There were consumed, besides, 1,225,000 francs in value of silk and cotton, making the total raw material consumed 18,285,000 francs. The total production of fabrics of this district was valued at 63,000,000 francs. The goods put in consumption, then, had a value three and a quarter times more than that of the raw materials consumed; that is, 3 francs 74 centimes for the raw wool, &c., and 9 francs 35 centimes for the manipulation, cost of capital, and profit.

But it is unnecessary to speculate upon the reasons of the remarkable development during the last half century of the class of manufactures under consideration. Roubaix and Bradford are in themselves enough to demonstrate that the combing wool industry, which, comparatively speaking, we have hardly touched, is for this country the most encouraging field for labor in the whole range of the textile industry.

It remains, pursuing the course adopted with regard to the other great centres, to consider the condition of the industrial population at Roubaix.

The average wages per day actually received, deducting the time actually lost, are stated as follows by the statistical authorities:

Combers of wool: men, 2 francs 60 centimes, (52 cents;) women, 1 franc 80 centimes, (36 cents.) Spinners: men, 2 francs 60 centimes, (52 cents;) women, 1 franc 80 centimes. Weavers: jacquard, 2 francs 25 centimes, (45 cents;) power loom, 2 francs 25 centimes, Dyers: 2 francs 60 centimes, (52 cents.)

It is estimated that the strict expenses for a household of five persons, the father and mother only receiving wages, are 2 francs 70 centimes (54 cents) per day; being 40 centimes (8 cents) for lodging, 1 franc 10 centimes (22 cents) for bread, 75 centimes (15 cents) for other aliments, and 45 centimes (9 cents) for washing, fire and light. In this calculation meat is not included, it being only occasionally used by the workmen. The total cost for the above items per year is between 986 and 1,000 francs. Estimating that the cost of supporting the family falls upon the father and mother, on the average conditions, their united wages are from 1,150 francs to 1,250 francs a year, being an excess above expense in the first case of 150 francs, and in the second of 250 francs. But in the above calculation neither clothing nor furniture are included, and absence from animal food is a condition of the estimate. Where family life must necessarily be so hard and austere, and having scarcely any enjoyment except that derived from performance of duty, we are not surprised to find among the statistics of a city provided even with schools and religious institutions, that in the year 1863, of a population of 54,000 there were but 487 marriages, and that there were 283 illegitimate births, of which 265 were not acknowledged.

It is due to the French social writers and statisticians to say that the facts illustrative of the condition of the laborers are stated without any attempt to justify them on the one hand, or to exaggerate them on the other. It would appear that the evils of the European rule of the compensation of labor are so vast and so entwined with the existing social and political system, that it is vain to attempt to grapple with them. "The question of wages," says one writer, "is one of the most important questions of our epoch, and perhaps the most difficult to resolve; we shall not attempt to discuss it." Another writer says: "Before long this question of wages will occupy a more important part than it has done before in the respective accounts and means of defence of the various industries." It is hoped that for this country, at least, the question of wages is solved by adopting the system of protection, not of manufactures, but of labor, "as the means of defence of our various industries."

OTHER EUROPEAN NATIONS.

BELGIUM, GERMANY AND AUSTRIA.

The other principal centres of the woollen industry upon the continent of Europe can be passed in review but briefly. In Belgium, the principal seat of the card-wool industry is at Verviers. This city, a century ago a town of 5,000 souls, has acquired through its woollen manufactures a population of 28,000, and with that of its suburbs of 40,000. In 1797 its production amounted to the value of three or four millions of francs. In 1864 the production was valued at 70,000,000 francs, its annual increase being at the rate of 10,000 pieces a year. The reputation of some of its manufacturers is nowhere surpassed, as of M. Sim-

monis, whose name stands first among the individuals who were honored by medals in the class of card-wool fabrics at the Paris Exposition. Belgium manufactures principally for foreign consumption, and the United States is one of its largest outlets. It is able to surmount the barriers of our duties, by reducing the wages of its workmen. The day's pay of many weavers does not exceed 1 franc 50 centimes, (30 cents,) and women do not earn more than from 80 centimes (16 cents) to 1 franc, (20 cents.) The average wages at Verviers is 2 francs (40 cents) for twelve hours' work. By means of this cheap labor, stuffs of wool mixed with cotton are produced which cost only from 1 franc (20 cents) to 1 franc 55 centimes (31 cents) the metre. The wear and dye are in proportion to the price. The low wages in Belgium are looked upon with no little alarm by England, and especially by the iron manufacturers.

The woollen manufacture of the Zollverein, that is, Germany without Austria, according to the most recent statements, employs 850,000 spindles, and produces tissues of a value of more than 400,000,000 of francs, of which 50,000,000 are exported. The cloths, especially the fine broadcloths and doeskins, are largely exported to this country. Competition with England and the surmounting of our duties are rendered easy by still lower wages than prevail in Belgium. The average price for a day's work for weavers in the country does not exceed 1 franc 25 centimes, (25 cents,) and for towns 1 franc 75 centimes, (35 cents.) Women are paid one-third less.

The following facts as to the production and wages at Aix-la-Chapelle, one of the most important centres of the card-wool industry, were obtained from Mr. Vesey, United States consul at that city, by Mr. R. W. Robinson:

"Annual production, 150,000 pieces, of 25 yards to the piece.

"Raw wool principally procured from Berlin, Breslau, London, and Antwerp, in the raw state, 7,500,000 pounds; average cost from 40 to 110 thalers, Prussia, the 110 pounds English—say 27 cents to 70 cents per pound, gold.

"*Wages—10,000 workmen.*

"Men earn from 3 to 5 thalers per week, \$2 25 to \$3 75.

"Women earn from 1⅓ to 3 thalers per week, \$1 to \$2 25.

"Children earn from ⅔ to 1½ thaler per week, 50 cents to \$1 12½."

Austria works up annually 77,000,000 pounds of wool into tissues which represent a value of \$50,000,000. The town of Brunn, in the heart of the pastoral province of Moravia, is one vast cloth factory, having at command an excellent situation at the confluence of two rivers and upon two lines of railroad, and also employing the best processes and machines. Its really admirable goods have been largely introduced into the United States, the introduction having been aided by a system of invoices in fraud of our tariff, hardly equalled in unscrupulousness elsewhere. The prices of sound cloths are the lowest in Europe, and the average wages do not exceed 1 franc 25 centimes (25 cents) a day.

GREAT BRITAIN.

It is through her wool that England has risen to the first place in the world in the textile industry. Her soil and climate favored the culture of sheep possessing qualities found in no other race or country. The prevailing national sentiment, as expressed in the words of one of its old writers, is that "wool is the flower and strength, the revenue and the blood of England." Its exclusive possession was secured by laws forbidding its exportation, and the acquisition of auxiliary wools from abroad was secured by their admission at small or merely nominal imposts. The woollen manufacturers having acquired the highest arts of the Low Countries and France, from the refugees whom the persecutions of the Duke of Alva and the revocation of the edict of Nantes had driven to the English shores, were "fondled, favored, and cherished," to use the words of Mr. Huskisson, by a persistency of national protection without parallel in the history of industry. The woollen industry was first planted in the eastern and western counties. In the 18th century it changed its seat to the counties of the north, where coal abounded for propelling machinery, and the neighborhood of large flocks of sheep gave the choice of fleeces, and in the West Riding of the county of York it has been developed into gigantic proportions. The most remarkable woollen establishments of the world are concentrated in this district, but distributed in four principal towns, each of which, by a law which seems universal, has devoted itself to a special industry. Leeds, to heavy drapery; Huddersfield, to light drapery; Halifax, to carpets; and Bradford, to thin and brilliant worsted stuffs. The effect of a succesful woollen industry upon population is remarkably illustrated in this district. In the West Riding, where there was a population of only 593,000 inhabitants in 1801, it had risen in 1841 to 1,154,000, and in 1867 to 1,375,000. In 1841 it had increased at Halifax from 63,000 to 130,000; at Huddersfield from 14,000 to 38,000; and at Leeds from 53,000 to 152,000. The increase of population is still more remarkable at Bradford, the great seat of the worsted industry. At the commencement of the century, when all the wool was spun and woven in the houses of the workmen, this town had a population of only 13,000 souls; in 1821 it had doubled the number of its inhabitants, which then reached 26,000. By the introduction of power-looms in 1825, the use of cotton warps with yarns of wool in 1834, and the employment of the hair of the alpaca and Angora goat, first used in 1836, the manufacturing industry was so developed that it sustained, in 1851, a population of 103,000, and of 115,000 in 1864, an increase of over 100,000 in half a century. In singular contrast with the infinite variety which Yorkshire now produces, and its industry, which occupies upon a district of 50 square miles 750,000 spindles and 35,000 power-looms, distributed in 932 establishments, employing 75,000 workmen, is the picture left by an ancient statute of the condition of the woollen industry in the city of York, in the time of

Henry VIII. During the reign of this monarch an act was passed in favor of the city of York, reciting and declaring "that the poor of that city were daily employed in spinning, dyeing, carding, weaving, &c., for the making of coverlets, and that the same have not been made in the same county till of late; that this manufacture has spread into other parts of the country, and was thereby debased and discredited; and therefore it is enacted that none shall make coverlets but the people of York." We see this wretched handicraft now expanded into the most magnificent manufacture to be found in the woollen industry of the world.

Although the West Riding of Yorkshire is the most important seat of the woollen industry in England, it is by no means confined to this district. Other centres are marked by the same singular devotion to particular branches observed in Yorkshire. While heavy pilot cloths, &c., for overcoats, are produced principally at Leeds, pantaloon stuffs and vestings at Huddersfield, blankets at Dewsbury, carpets and damasks for furniture at Halifax, all in Yorkshire; tweeds, tartans, shawls, &c., are made principally at Galashiels and Hawick; imitation cashmere shawls, at Paisley; flannels, in Wales, and at Rochdale; heavy goods, such as blankets and rugging, horse-cloths, &c., in Oxfordshire, and at Witney, Chipping Norton, and Kendal, in Westmoreland; hosiery, at Nottingham, and silk and wool poplins at Norwich; each of these points being recognized as the headquarters of the branches of production above enumerated.

We find a singular deficiency of recent statistics respecting the woollen industry of Great Britain, proceeding from the characteristic reticence of its manufacturers. This is observable in the proceedings of the Chamber of Commerce of Bradford, where we might expect to find detailed information. The most recent statements are those given by Mr. Symonds, in 1861. From them it appears that the total value at that period of the woollen manufacture of the kingdom, separate from the worsted manufacture, was £20,290,079, composed of the following items: 76,000,000 pounds of foreign and colonial wool, valued at £4,717,492; 80,000,000 pounds of British wool, at 1*s.* 3*d.* per pound, £5,000,000; 30,000,000 pounds of shoddy, at 2½*d.* per pound, and 15,000,000 pounds of mungo, at 4½*d.* per pound, together £609,370; cotton and other warps, used in the union and mixed cloths, £206,537; dye-stuffs, oil, and soap, £1,500,000; wages, £150,000; work people, at 12*s.* 6*d.* per week, £4,875,000; rent, wear and tear of machinery, repairs, coal, interest on capital and profit, 20 per cent. on above, £3,381,680. According to the same authority, the worsted manufacture consumes 80,000,000 pounds of British wool, and 15,000,000 pounds of foreign and colonial wool, and employs 125,000 hands. The whole number of operatives engaged on wool is 275,000. The total number of persons, directly dependent upon the woollen industry, is set down at 837,500, including the workmen, there being a larger number of dependent workers in auxiliary trades than in connection with any other manufacture.

It is not proposed to give the details of the compensation of labor in

the woollen industry of Great Britain. English statistical statements of the reliable character of those given respecting the French industry are wanting. The rates obtained from scattered sources vary so much in different establishments, locations, and employments, that facts supplied by a few establishments would lead to no correct conclusions. A better opinion can be formed from a general view than a microscopic examination. M. Reybaud is of opinion that, throwing aside the exceptional cases where the receipts of an English workman and his wife would amount to 3,000 or 3,500 francs, the average receipts for the couple cannot be fixed at less than 1,700 or 1,800 francs, the receipts in Roubaix in corresponding cases being 1,350 francs, and at Amiens 900 francs. The average wages in this industry, although materially less than in this country, particularly for common hands, and women and children, are greatly above those in France and other countries on the continent. The Chamber of Commerce of Leeds, according to the author last referred to, estimates the wages of the workman at 35 francs for the articles best paid, and at 22 francs for those which are least paid, with intermediate rates. American manufacturers admit that it is not so much the lower rate of wages in England against which we have to contend, as the low rates of interest, which permit the employment of vast capital and most the advantageous use of machinery, together with the abundance of labor which may always be recruited from the vast reserve corps of paupers, eager to be elevated to the rank of workmen. A marked improvement in the material condition of the workmen, especially in Yorkshire, has been effected of late years by the increase and the lessening of the cost of subsistence. In the West Riding the labor which, in the period from 1845 to 1847, produced 10 shillings per per week, will earn at present 16 shillings per week. The food for a family which then cost 9*s.* 9*d.* is now obtained for 6*s.* In this industry at the present day, the Yorkshire workmen are able to consume animal food at least twice a day, to be respectably clothed, to have some luxuries, and accumulate savings. They are the envy of the workmen of the continent. Without stopping to inquire whether this change has been brought about by chartist agitation, the trade unions, the self-interest of employers, or the moral enlightenment of the English nation, we recognize the fact that the material condition of the English workman is vastly superior to that of his brother workman in France, Belgium, Prussia, and Austria. On the other hand, it is now freely admitted in England that the general and technical education of the English operative is far inferior to that of the workmen of the nations above-named. The Universal Exposition at Paris served to open the eyes of England to the startling fact that she had been making but little progress in manufacturing and mechanical industry since 1851, compared with that made in many other European countries. Among the responses of eminent jurors to a request for information, addressed by the Schools Inquiry Commission of July 2, 1867, we find the following statements as to the inferiority above referred to, and its apparent cause.

Dr. Playfair says: "A singular accordance of opinion prevailed that our country had shown little inventiveness, and made little progress in the peaceful arts of industry since 1862." Professor Tyndal says: "I have long entertained the opinion that in virtue of the better education provided by the continental nations, England must one day, and that no distant one, find herself outstripped by those nations both in the arts of peace and war." More pertinently to the immediate subject of this report, Mr. Huth says: "I am sorry to say that, although we may still be unsurpassed in many of our productions, we no longer hold that pre-eminence that was accorded to us in 1851. The enormous strides that have of late been made by our continental rivals in France, Belgium, Prussia, and Austria, will make it daily more difficult for our woollen manufacturers to hold not only their former prominent position, but even to maintain their present one. I found that it is the want of industrial education in this country which prevents our manufacturers from making that progress which other nations are making. I found both masters and foremen in other countries much more scientifically educated than our own. The workmen of other countries have a far superior education to ours, many of whom have none whatever. Their productions show clearly that it is not there a machine working a machine, but that brains sit at the loom, and intelligence stands at the spinning wheel."

The references here made to the provisions for scientific and technical education upon the continent of Europe are worthy of grave consideration in this country, and the examples cited should stimulate us to extend such institutions as already exist here in the schools of the Cooper Institute of New York, and the Massachusetts Institute of Technology. The cause, however, of the decline of the industrial arts in England, so fully admitted in the testimony of her own experts, is to be found in a source more deeply seated than in a simple deficiency of technical education. Schools of art are the result, as well as the cause, of a national sentiment of excellence, and such a sentiment cannot be predominant in a nation where the ruling idea of its system of manufacture is production at the cheapest possible rate for the utmost possible consumption. A constantly declining standard of excellence is inseparable from this idea. The fruits are seen in the shoddy cloths, the fragile railroad iron, and the hardware, to which no more opprobrious term can be applied than that derived from its chief seat of fabrication—the trashy fabries and wares inundating every country which does not protect itself by domestic production and defensive duties. It is to the commerce which this system of manufacture nourishes that the famous line of Goldsmith is so justly applicable—

"And honor sinks where commerce long prevails."

The French economists deplore the influence of this idea, which has crept into France, in consequence of the Anglo-French treaty, and they assert that it has exerted a baleful influence upon French artists who have sojourned a long time in England. "They lose their manner," it is said; "their imagination is subdued; it is a flame which becomes extin-

guished by the positive and cold spirit of the English." The woollen manufacturers of this country in producing, as they have done formerly, chiefly for the masses, have followed too much the present English system, instead of aiming at the standard of the old English masters of the woollen industry, and of their descendants in the western counties, who produce for the home markets, or the still higher standard which we have seen prevailing in France. The system which may be profitable for a foreign trade cannot be permanently remunerative for domestic consumption. In fabricating for the home markets the delinquencies of the producer are like personal "sins," which, in the words of the homely proverb, "always come home to roost." The false economy of making poor, or, more properly speaking, dishonest fabrics, is sure to be at length demonstrated by reclamations of buyers, by accumulating stocks, and, finally, by bankrupt establishments.

Our manufacturers, in producing even for the masses, should consider how rapidly the masses in this country are improving in taste and in appreciation of what is really good, and that American consumers will no more be satisfied with ordinary fabrics than American mechanics with cheap tools. Let the ancient device of Roubaix, "*Industrie et probité*," be the rule also of American manufacturers; let the surprising advance of our woollen industry in the last five years be the earnest of its future progress, and the excellence and variety of its products will excite in the people a sympathy in our struggles and a national pride in our achievements. By our own faithful work we shall secure the final condition of success—a positive public sentiment which shall pervade the country in favor of the products of its own soil and labor.

E. R. MUDGE,

United States Commissioner to the Paris Exposition of 1867.

APPENDIX A.

AMERICAN MERINOS.

Prepared by request, for this report, by Hon. Henry S. Randall, LL. D., President of National Wool Growers' Association.[1]

Full-blood American merino sheep, as that designation is now understood, include only full-blood descendants of the merinos imported from Spain into the United States near the beginning of the present century. Six were introduced by different persons between 1793 and 1802. In the last named year, Mr. Livingston, the American Minister in France, sent home two pairs obtained from the French government flock. Later in 1802, Colonel Humphreys, the American Minister in Spain, on his return from his embassy, shipped a flock to the United States, of which 21 rams and 70 ewes safely reached his farm in Connecticut. The merinos imported prior to these last have not, so far as is known, left any full-blood descendants.

Col. Humphreys published no detailed account of his purchase or of the previous history of his sheep. He evidently regarded the fact that he purchased them, and that he obtained them directly from the merinos of Spain, as all that was important to be known, and as a sufficient guarantee of their blood and quality, and so indeed it was. He was a singularly high-toned and public-spirited man—wealthy—intent on doing a patriotic service to his country by introducing these sheep; and that he fully supposed that he had accomplished the latter object he himself bears witness. In his poem "On the industry of the United States of America," he proudly declares:

"Not guarded Colchis gave admiring Greece
So rich a treasure in its golden fleece."

The particular Spanish family or families from which his sheep were selected cannot now be regarded as a matter of any consequence; but from investigations which circumstances formerly impelled me to make among all the accessible public and private records and facts appertaining to the subject, I came to the undoubting conclusion that they were drawn from a single family, and that the Infantado.

Judging from the statements in Colonel Humphrey's manuscript letters lying before me, he not only found great satisfaction but great success in breeding his merinos. The very ones he brought from Spain, he says, increased half a pound in their fleeces; and their descendants continued to improve in that and every other particular. He speaks glowingly of their hardiness and propensity to fatten; and in the highest terms of their mutton. This gentleman died in 1818, when causes, hereafter to be

[1] Author of Sheep Husbandry in the South, Fine Wool Husbandry, The Practical Shepherd, &c., &c.

detailed, had sunk the merinos into contempt and neglect. His invaluable sheep were then scattered, and, as a general thing, they appear to have fallen into the hands of those who attached no great value to their blood, for I can learn of but two or three instances where they were preserved distinct after 1826.

The next importations of importance were made by Mr. William Jarvis, American consul at Lisbon, Portugal, in 1809 and 1810. Taking advantage of the offers of the Spanish Junto to sell the confiscated flocks of certain Spanish nobles, he bought and shipped to different ports in the United States about three thousand eight hundred and fifty merinos. He wrote to me, in 1841, that about thirteen hundred of these were Aqueirres, two hundred Montarcos, the rest Paulars and Negrettis—mostly the former. He says: "Those I reserved for myself were composed of about half Paulars, a quarter Aqueirres, and the other fourth of Escurials, Negrettis and Montarcos, which I subsequently mixed together."

In regard to other importations at this period, Mr. Jarvis writes in the same letter: "There were sent in the latter year (1810) by others about two thousand five hundred, composed of Paulars—had of General Downie—Montarcos, Aqueirres and Guadalupes. Part of those went to New York, part to Boston. All those sheep were Leonesa, trans-humantes, and were of the prime flocks of Spain. I have been able to be thus minute in relation to the merinos in 1809 and 1810, as I was then American consul at Lisbon, which was the port from which they were all shipped, it being only about one hundred miles to Badajos, and the nearest seaport to that place." Some of these cargoes did not reach the United States until 1811. I have elsewhere given the names of a number of the importers, and it is not necessary to repeat them here.

The circumstances existing at the time of the introduction of these sheep were highly propitious to their careful breeding and rapid diffusion. From 1807 to 1812 the maritime regulations of England and France, and our own retaliatory ones, paralyzed, and during a portion of the time entirely suspended, our foreign trade; and the ensuing war with England, which lasted to 1815, completely swept our commerce from the ocean. Thus our people were driven to the establishment of wool and other manufactures, and to the production of the raw materials. State legislatures, the public press, and politicians of every party and grade, encouraged efforts in that direction, and patriotic as well as pecuniary enterprise warmly responded to these appeals. The new importation of merinos was hailed with enthusiasm. From $1,000 to $1,500 a head was frequently paid for them. Flocks of full-bloods or grades were started in all parts of the country. Unwashed full-blood wool rose to $2 50 a pound during the war.

The peace of Ghent exposed our infant and unprotected manufactures to the competition of the world. The exhaustion and derangement of our finances accelerated their overthrow, and they fell without a strug-

gle, and irretrievably. There was no longer any market for fine wool in the United States; and merinos valued at $1,000 a head in 1809 sold for a dollar a head in 1815. Their propagation as a separate breed was thenceforth abandoned by most owners, and the great mass of them became merged in the common coarse sheep of the country.

This state of things continued until 1824. In the tariff of that year the protective policy on wool and woollens, inaugurated by the tariff of 1816, was so far extended that it was supposed it would make fine wool production again profitable. The Saxon (merino) sheep were introduced, and created a new fine wool furor equal to that between 1809 and 1815. The tariff of 1828 increased the protection and increased the excitement.

If we did not know the singular one-ideaism which so often characterizes these "improvement" manias, it would be a subject of astonishment that while the Saxon sheep were sought with so much eagerness, commanding quite equal prices with those of the Spanish merinos fifteen years earlier, the pure blood flocks of the latter yet in the country attracted comparatively little notice, and they were chiefly valued because they would grade up more rapidly than other sheep toward the Saxon standard of fineness; in other words, make a better cross with the Saxons. Most unfortunately a large share of the holders of the Spanish, or "old-fashioned merinos," as they were then called, adopted the same theory of relative value and rushed into the cross, breeding steadily towards the Saxons, so as to obliterate the distinctive Spanish characteristics as rapidly as possible. Yet at that very time, and at all subsequent times, prime Spanish fleeces were worth more in market than Saxon fleeces. The greater weight of the former more than compensated for the greater fineness of the latter. The Spanish were a strong, hardy, thoroughly acclimated sheep, well adapted to our climate and systems of husbandry. The Saxons were the reverse in every particular.[1]

Yet for upwards of fifteen years the Saxons maintained an almost undisputed ascendancy. Their faults were attributed to want of acclimation. They had cost too much to be readily given up. They were in the hands of the wealthy influential farmers, prominent in agricultural literature, and prominent in politics, who believed themselves and convinced others that the conditions of success could be secured by protective legislation. A corresponding class of manufacturers urged the same views. A constant struggle was kept up on the floors of Congress between the friends and enemies of protection, each usually maintaining extreme views, so that when either was victorious extreme measures

[1] To a similar statement in "Fine Wool Husbandry" I appended a note, which with a slight change I will copy here:

"I trust no former breeder of the Saxons will complain of these remarks, when I say '*quorum pars fui*.' Thirty-eight years ago I became the owner of a pure Spanish flock. Subsequently I purchased some Saxons, and was so gratified with the produce of a few picked sheep, that I bought and bred a flock usually numbering from 500 to 700. They were derived from the most celebrated flocks. I kept them several years and gave them a fair trial before going back to the Spanish merinos, which, very fortunately for myself, I had never entirely abandoned."

were adopted. Consequently there was none of that steadiness or permanency in the public policy, under which industrial interests materially affected by foreign competition can alone flourish. I have not space here to give the provisions of the different wool and woollen tariffs, but a glance at the prices of wool under them will throw some interesting light on the subject under examination.

Under the tariff of 1824, in force until September, 1828, fine wool averaged a trifle over 45 cents a pound; under the tariff of 1828, extending to March 3, 1832, about 57 cents a pound; under the tariff of 1832, extending to January, 1834, about 57 cents a pound; under the tariff of 1833, to towards the close of 1837, about 66⅔ cents a pound; thenceforth under the same tariff, extending to October, 1841, about 51⅜ cents a pound; under the tariff of 1841, extending to September of that year, about 46¼ cents a pound; under the first year of the tariff of 1842, about 35¼ cents a pound; thenceforth under the same tariff, extending to December, 1846, about 41 cents a pound. During this entire period of 22 years, fine wool did not on the average exceed medium wool in price more than 10 cents a pound, and medium still less exceeded coarse.[1]

During the same period, pure Saxon sheep in the best flocks averaged less than three pounds of wool per head. In 1840 the flock of Henry D. Grove, the celebrated German importer and breeder—not numbering over 200 sheep, and well kept—yielded an average of 2 pounds 11 ounces of washed wool a head, and he regarded this product as so satisfactory that he adduced it as a proof of the value of his favorite breed in that controversy between the advocates of the Saxons and Spanish merinos which was then filling our agricultural publications.[2]

This controversy had opened in about 1835. At that period small picked lots of Spanish merinos, purchased by different persons of Mr. Jarvis, yielded 4½ pounds of washed wool a head. The flocks of Stephen Atwood, of Connecticut; of John T. Rich, of Vermont; of Francis Rotch, of New York, and my own, yielded an equal amount.[3]

The increase in the weight of Spanish fleeces was thenceforth rapid. In 1844, my Humphreys sheep yielded 5 pounds 13 ounces of washed wool a head,[4] and a small lot of Rich ewe tegs purchased in Vermont, five pounds. In 1845, Mr. Stephen Atwood wrote to the author of the

[1] From 1827 to 1861 inclusive, a period of 35 years, the average price of fine wool at Boston was 50 3-10 cents; of medium, 41 8-10 cents; of coarse, 35½ cents. Fine wool averaged 15 per centum higher than medium, and medium 14 per centum higher than coarse.

[2] See his letter to me in "Transactions" of New York State Agricultural Society, 1841, p. 333.

[3] Mr. Atwood's flock and my own, here referred to, were descended from Colonel Humphrey's flock; Mr. Rich's from a Paular importation made at New York in 1811; Mr. Rotch's were selected from different flocks.

[4] Four of the ewes had two years' fleeces on, but I thought this fully offsetted by the number of tegs in the flock, which, under the usual treatment of those days, yielded considerably less wool than grown sheep. My Premium ram's first fleece in 1844 was 10 pounds. In 1847 one of my ewes produced 7 pounds 10 ounces. In 1849 one of my rams produced 13 pounds 3 ounces. All wore well washed.

American Shepherd, that his flock consisted of 150 half ewes and half rams and wethers; that his ewes yielded five pounds of washed wool per head, and his lambs an equal amount; that his wethers yielded six pounds, and his rams from seven to nine pounds; that his heaviest ewe's fleece in the preceding spring was six pounds six ounces, and the heaviest ram's fleece 12 pounds 4 ounces. I think a few other flocks yielded about equal amounts of wool, but the facts are not before me. The prime merinos of that period then were producing upwards of two pounds more of wool a head than prime Saxons, while that of the latter fetched in the market but $6\frac{3}{4}$ cents per pound most in 1845, and but $6\frac{1}{4}$ cents per pound most in 1846.

The Saxon breeders had never received anything like a proportionable remuneration for their wool. They had lived on hopes deferred, looking for changes which never came. When the tariff of 1846 overthrew the broadcloth manufactures of the country, there was no longer any ground for hope, and the Saxon sheep rapidly disappeared and gave place to the American merinos, as the Spanish sheep were thenceforth generally called.

They had indeed become a distinctive variety, like the Saxon Merino, the French merino, &c., presenting both essential and visible differences from their Spanish ancestors or from any other merino family. They differed materially from the Spanish in amount of wool, size, and form. The weights of prime American washed fleeces have just been stated. Livingston gives the average weight of the Spanish ram's fleece, *unwashed*, at the beginning of this century, at $8\frac{1}{2}$ pounds—Youatt at eight pounds. Both give the average of the unwashed ewe's fleece at five pounds. The King of England's carefully selected Negrettis, about 100 in number, yielded, for five successive years, (1798–1802,) an average of $3\frac{153}{247}$ pounds of brook-washed wool—scoured weight $2\frac{152}{247}$. This included the wool of some wethers (the number unspecified) but no rams.[1] In 1801 Dupont de Nemours and an associate sent to the United States unquestionably the largest-fleeced Spanish ram ever introduced here.[2] He produced $8\frac{1}{2}$ pounds of washed wool. Colonel Humphreys mentions it as a matter of note, in a manuscript letter which I have read, that a merino ram bred by himself yielded seven pounds five ounces of washed wool.

In respect to size and form, Petri, who visited Spain in the early part of this century to examine its merinos, gave a table from which I select

[1] See Sir Joseph Banks's annual reports concerning this flock.

[2] Dupont de Nemours was head of the commission appointed by the French government to select the merinos given up by Spain by the treaty of Basle. He and M. Delessert sent four rams to America, three of them intended for their own farms in this country, and one for President Jefferson. All but one perished on the passage. The remark in the text is confined to Spanish sheep imported from Spain. French merinos of heavier fleece were subsequently introduced.

the following admeasurements. I add some corresponding ones of American merinos:

Names of flocks.	Weight, including wool.	Length from mouth to horns.	Length from horns to shoulders.	Length from shoulders to tail.	The whole length.	Circumference of the belly.	Height of the fore legs.	Height of hind legs.	Distance of hip bones apart.
Negretti:	*Lbs.*	*In.*	*Ft. in.*	*Ft. in.*	*Ft. in.*	*Ft. in.*	*Ft. in.*	*In.*	*In.*
Ram	97	9¼	1 7	2 2	4 6¼	4 1¼	1 3	10	6
Ewe	67	8½	1 6	2 1	4 2¾	4 1½	1 1	9½	4½
Infantado:									
Ram	100½	10	1 6	2 3	4 7	4 2	1 0	9	6
Ewe	70	9	1 5¼	2 1	4 3½	3 11	1 0	8½	5¼
Guadeloupe:									
Ram	97½	9	1 6	2 2	4 5	4 5¼	1 0	8	6
Ewe	69	9	1 2	2 1	3 11	3 9	10½	6½	4
Estantes of Sierra de Somo:									
Ram	96½	9½	1 6	2 0	4 3¾	4 2¾	1 0	8	6
Ewe	62½	9	1 2	2 1	4 0	3 10	11	7	5
Small Estantes:									
Ram	42	7½	1 3	1 9	3 7½	3 2	10	6½	3
Ewe	30	7	1 1	1 6	3 2	2 10	8	6	3
American merino:									
Ram	122	9	10	2 4	3 11	4 4½	11	9	9
Ewe	114	9½	10	2 4	3 11½	4 1¼	11	9	8
Ewe	122	9	10	2 5	4 0	4 3	9	9	8
Ewe	100	9	11	2 3	3 11	4 ¾	8½	8	8

The weights and measures given of the Spanish sheep are Austrian, a little exceeding English weights and measures. From a careful comparison of all the figures, I think Petri must have taken the circumference of the belly without compressing the wool, for if there was no greater difference in this particular, it is difficult to see from the above table—notwithstanding the marked superiority in breadth of hip of the American sheep—why they should have weighed so much the most. The American ram represented in the table was a small one, not usually weighing over 100 pounds with his fleece off. A full-sized one of the family (Infantado) would have weighed from 10 to 25 pounds more. The ewes were rather above the average of my grown sheep of the same family, and were in good ordinary condition. My measurements were made in 1861, and therefore do not exactly represent merinos of 1846; but I think the change in size and form was not very considerable between those dates; and I am not aware that any corresponding data of the American merinos of 1846 are preserved.

Some persons perhaps will get a clearer idea of the difference between the form of Spanish and American merinos from descriptive terms than from the above figures. The American sheep was far the lowest, roundest, and most compact animal, broader on the hip, fuller and broader in the bosom and breech, and shorter, proportionably, in the neck and legs. The Spanish migratory sheep travelled 800 miles a year, and, all things

considered, with great rapidity; and his deep, narrow chest, longer legs, and lean form—making some approach to that of the deer—adapted him to that necessity. The American farmer had no occasion for such properties, and he bred a sheep better calculated to take on flesh and fat, and possessing more of the essential points which are found most profitable in animals not required to travel far for their feed.

The American merino has not much increased in size during the last 20 years, and probably scarce any since 1861. Our breeders, indeed, have sought no such increase, considering it unprofitable in respect to wool production, inasmuch as smaller animals have more surface in proportion to weight than larger ones, and believing that a development of size greatly beyond the long established limits of the breed is unfavorable to vigor, hardinesss, and easy keeping. I think the introduction of French merinos (1840–1850) exerted much influence on public opinion and taste in this particular. These great overgrown sheep, which at first attracted so much admiration, proved so completely weak and worthless that our breeders got to eschew everything resembling them, and the popular impression was that their want of constitution was due to their extraordinary size for the breed, or rather to the same causes which had produced that size.[1]

The Rich or Paular family of American merinos, when not much mixed with the Humphreys or Infantado family, are smaller than the latter—having been bred purposely in that direction by their earlier proprietors, to adapt them to the short keep of the Vermont hills. In their natural and unpampered state, they are nearly as hardy under privation and exposure as the British mountain breeds. The unpampered American Infantado is also a hardy sheep, but requires more food than the former. The two families bear the same relation to each other as do Devon and short-horn cattle. One is the most profitable in sterile and exposed situations, the other on rich lands and generous keep. Latterly, the Paular family have been, to a large extent, crossed with and bred towards the Infantados, but I think it highly expedient that they be preserved as a distinct variety, to meet the wants of many portions of our country.

While the carcass of the merino has been so materially improved in the United States, and while its improved form has doubtless diminished its capacity for long and rapid travelling, I am not aware that it (I speak of unpampered sheep) has lost in any characteristic of value for its present situation. From my own recollections of the breed when it was but little changed from the original Spanish model, and from all the

[1] I do not intend to apply these remarks indiscriminately to the merinos of France. The stock imported by Mr. D. C. Collins, in 1840, from the royal flock at Rambouillet, were not thus overgrown. Their size, however, materially exceeding that of the American merino, was an entire novelty and a most captivating one to the popular eye. Consequently most of the later importers selected not only from the largest French stocks, but the largest sheep of the flocks from which they purchased—often paying comparatively little attention to other characteristics. These gaunt, unthrifty monsters, required an excess of keep and care, and then they generally perished within a year or two of the period of their introduction here.

older recollections of experienced and reliable men with whom I conversed many years ago on the subject—men in various instances whose recollections of these sheep extended back to the time of their importations in 1809–1811, I am satisfied that their vigor of constitution has been on the whole increased; that they are more prolific, and furnish their offspring more milk; and it is certain, as already said, that they fatten more rapidly and better, and furnish better mutton. They accumulate, it is true, far less fat than the English mutton breeds; but good merino wethers are favorites in our markets. Their meat is darker colored and shorter grained than that of English sheep. It flavor is good. Multitudes of Americans prefer it to English mutton, and especially to Long-wool mutton; and the lambs of Southdown rams and grade merino ewes sell in our early markets for equal prices, pound for pound, with full blood Southdowns; perhaps the only other variety which habitually commands an extra price. And it has been found that pampering from birth, as mutton sheep are pampered, gives the merino a very liberal share of that early maturity which has been denied to it by those who have described the original variety. I am not contending, by any means, that the improved American merino rivals the British breeds as a profitable mutton sheep; but I would show that it no longer takes the low rank in that particular which has been traditionally assigned to it, and that its mutton has become an important consideration in estimating its general value, or its comparative adaptation to special localities.

But it is in weight of fleece that the American merino has made the most remarkable advance beyond its progenitors. We have seen that in 1844–'5 small very choice lots yielded an average of over 5 lbs. a head of washed wool. Now flocks of several hundred, including tegs, without any wethers and not more than one per cent. of rams, on fair ordinary keep, yield an equal amount. Flocks of picked sheep yield 6 lbs. a head, and small, high-kept lots a pound or two more, all of washed wool.

It has become difficult indeed, for reasons which will presently appear, to learn accurately the amount of well-washed wool in a large proportion of the heaviest-fleeced small flocks. These are usually in the hands of "breeders"—ram-sellers, as they are termed in England—who raise sheep especially to sell them for breeding purposes, and who expect to obtain extraordinary prices. This business has been highly remunerative for a number of years; and during the recent war of the rebellion, the demand for choice merinos swelled into a mania. According to the popular idea "king cotton" was dead, and there was to be no resurrection for him. Woollen fabrics were permanently to supersede cotton fabrics in clothing, and in everything else where it could be employed as a substitute. There was therefore to be an enormous and perpetual demand for wool at high prices. Stimulated by such golden prospects, sheep holders increased their flocks, and made the most energetic efforts to improve them by the purchase of valuable rams; and thousands of

persons, wholly inexperienced in the business, abandoned other pursuits to embark for the ovine El Dorado. I think, speaking within bounds, I received two or three thousand letters, between 1861 and 1867, from lawyers, doctors, small merchants, clerks, mechanics, men out of business, clergymen, and farmers not previously engaged in sheep husbandry, who propounded inquiries on the subject of breeds, the most profitable localities for wool growing, and other matters connected with the establishment of flocks.

The prices of sheep rose above the high-water marks of 1809–15 and 1824–28. Without speaking of "refused offers," which sometimes are not very real, I know that an American merino ram actually sold for \$5,000; quite a number of others at \$3,000 to \$4,000 each; and multitudes at \$500 to \$1,000 each. Several ewes were sold at \$3,000 each; more at \$2,000 each; and many at \$500 to \$1,000 each. There was the most eager competition to secure celebrated and costly animals; for every man expected to become a ram seller forthwith, and he found no difficulty in convincing himself how very soon he could thus obtain back his original expenditure, and then, by an easier process than was dreamed of by the alchemists, transmute his sheep into gold. In the permanent improvements of flocks, these costly animals, it is true, often richly paid for themselves;[1] but many of the recent adventurers in the business were not satisfied with this—were not satisfied because they could not at once sell for as high prices as they had given; and when at the close of the war a temporary depression necessarily ensued in the woollen and consequently in the wool markets, (owing to causes which do not demand explanation here,) they were as anxious to abandon as they had been to embark in sheep husbandry.

This remarkable era in merino breeding, commencing in sound measures of improvement, but culminating during the war in the excitement which I have described, developed several fashions in breeding and management which were altogether new in the business. Quality of wool was little talked about. Weight of fleece was the primary con-

[1] Take an example. My American merino ram, "Twenty-one per cent," (measurements, &c., of which are subjoined to Petri's table, heretofore given,) was previously owned by Major Davis Cossit, of Onondaga, New York, and used by him in 1859 and the two succeeding years. His ewes were Saxons, with sufficient American merino blood to yield, on ordinary keep, about 4 lbs. of washed wool a head. In 1862 the fleeces of the progeny of this cross were first weighed separately. Eighty-three two-year old ewes yielded 552 lbs., and 80 yearling ewes 504 lbs. of washed wool—within a fraction of 6¼ lbs. a head. Each lot was the entire one (of ewes) of the year. In 1863, 65 two-year old and 92 yearling ewes yielded 1,119½ lbs. of washed wool, or an average of 7 lbs. 2 oz. a head. The yearlings were not over 14 months old when shorn, and none of the sheep had been pampered. The original stock of ewes would never have fetched over, say, \$8 a head immediately after shearing. For their progeny (ewes) the owner was offered \$30 a head. The grade rams were mostly sold in lots, for \$15 to \$25 a head. I used this ram three years on my full-blood ewes; and I think he permanently increased the wool product of the flock half a pound per head—quite as extraordinary a gain as the preceding one, when the blood and previous product of my flock are considered. This remarkable ram was bred by Mr. Hammond, of Vermont.

sideration; and it became the custom of many "breeders" to weigh the fleeces in the yolk, because, I suppose, it gave them an advantage over others. A rigid system of housing their sheep from contact with rain or snow the year round would preserve all the yolk in the fleece, and this would add to its weight several pounds. The holders of larger flocks could not do this without great inconvenience and expense. The former, therefore, were enabled to go into the newspapers with far higher statements of weights of fleeces. Inasmuch as this system of housing and preserving all the yolk in the wool gave the fleece externally a very dark color, that color soon became a prime necessity of fashion. And as the more the yolk, the more the weight and the darker the color, yolk itself was as carefully bred for as wool. I have seen it literally dropping from the fleece under a hot sun. As a high-fed sheep produces considerably more wool and yolk than an ordinarily kept one, a system of pampering was also extensively resorted to. Many of the summer and winter housed flocks were fed grain to the utmost verge of immediate safety, and far beyond the bounds of ultimate safety; for such continued forcing is destructive to the constitution and longevity of merino sheep, as all will bear witness who have tried or observed its effects.

Under the above system of breeding and treatment, and sometimes without any special pampering, merino rams' fleeces in the yolk are frequently reported as weighing upwards of 25 pounds, and some have risen to 30 pounds. Ewes' fleeces range from 10 pounds to 15 pounds, and sometimes individuals or small lots have gone higher. Unfortunately these weights afford scarcely an approximate criterion of the actual weight of the *wool*, the proportion of yolk to wool possessing no uniformity. The breeders' customs above described constitute the reason which I promised to give, in a preceding part of this paper, why the present amount of well washed wool in most of the heaviest fleeced flocks cannot be accurately determined.

The practice of housing sheep from rain and snow for the preceding objects is not a fraud, if distinctly avowed to all buyers. But I think it productive of no benefit, and of considerable injury. It is a useless waste of a good deal of time, and occasionally produces loss in other respects. The new-mown hay or grain must be left to get wet on the ground, to the serious deterioration of its quality, rather than have the precious weight-giving and color-giving yolk washed out of the fleece! And there can, it appears to me, be no reasonable doubt that this habitual non-exposure to the ordinary changes of weather must, in the course of time, to a greater or lesser degree, beget an incapacity to endure such exposures with entire impunity. Besides, this housing, if ever so frankly proclaimed, tends to warp the judgment of all buyers, and especially inexperienced buyers. If it did not give a fictitious value to the animal—rendering it more salable than sheep of equal value not thus treated—what would be the use of it? It is perfectly notorious that it, with early shearing,[1] does

[1] These "fitted" sheep are sheared from a month and a half to two months earlier than sheep in general.

so alter the appearance of sheep, that a pair of twins of the closest resemblance, one thus treated and the other not, scarcely look as if they belonged to the same variety, and the "fitted" one will far outsell the other. It is considered the breeder's right, in all kinds of domestic stock, to "put the best foot forward," and it is equally done with other breeds of sheep; but it is a pity that a higher standard of action cannot be permitted to prevail. Such fashions beget inducements to direct fraud. Thousands of *painted* sheep (painted to the *true* color by a preparation of oil, burnt umber, and a little lampblack) are annually hawked about the country, with pedigrees as artificial as their color, and sold as genuine simon pures.

Fitting sheep for sale by pampering is fraudulent, for it is never avowed or admitted, and if it were so, there can be no honest or decent excuse for a practice which is directly and undeniably fatal to the well-being of the animal. We have no right to poison what we sell, because we know there will be fools to buy it, and to buy it more readily because it is poisoned. Another result has followed this indiscriminate scramble for huge fleeces. Those who have carried it farthest have usually considerably depreciated the quality of the wool. The finest fleeces are not generally the heaviest. The greatest combination of wool and yolk—however coarse, uneven, and even hairy, the former—has been what these extremists have looked for in their breeding rams; and the progeny of such rams must of course partake of the same characteristics. I shall presently speak of the prevailing character of American merino wool.

To complete my account of these animals I must allude to one more modern fashion, that of breeding those folds and corrugations of the skin, usually termed "wrinkles." They, to a certain extent, characterized the original Spanish merino when introduced into this country, but they were confined principally to the neck. To a reasonable extent they are approved of in all countries where the merino is bred, being understood to indicate heavy fleeces. But our American extremists reasoned that, if some were desirable, more would necessarily be better; and these wrinkles "took the eye" of novices. Our most sagacious breeders have continued to resist this innovation; but it is not uncommon to see rams, and even ewes, in addition to enormous neck-folds, closely covered from head to tail with folds in the skin, elevated an inch or more from the surface of the body. There are two profound objections to this. The wool on the upper part of the ridges very rarely corresponds in quality with that between them, thus destroying all evenness of fleece; and it often takes an expert shearer two hours to clip off the fleece of one sheep evenly. With shearers at \$2 to \$2 50 a day, the last consideration will prove an important one among wool growers who own sheep in any considerable numbers, and this miserable fashion cannot long prevail.

Notwithstanding the shams and deceits, as well as more innocent practices, which have been resorted to by a class of sellers of American merinos to produce great fleeces in their unwashed state, there has

unquestionably been a very great improvement in the actual weight of the washed or scoured fleeces within the last few years. I do not believe there is any other national family of merinos, or any other breed of sheep whatever, that can vie with them in this respect. This fact is, I think, established by the scouring tests made so frequently during the last few years by State and local wool growers' associations, and by individuals. In all these, which have commanded any attention, the sheep have been publicly shorn at the meeting of an association, or, in individual tests, in the presence of a number of reputable witnesses. The age of the fleece has been proven by affidavits. Where the test made was the proportion of wool to weight of animal, the animal has been publicly weighed when shorn, and its condition noted. The associations have selected competent and reliable wool manufacturers to perform the scouring, and required of them statements of processes and results. The New York State association, in its scouring tests of 1865, 1866, and 1867, appointed a committee of eminent and experienced gentlemen to make an examination of all the facts and of the scoured wool;[1] and other State and county associations, and individuals, have taken these or other steps deemed necessary to secure accuracy and command entire public confidence.

These experiments have demonstrated that the *scoured* fleeces of American merino rams of full growth not unfrequently range from six to over eight pounds, and in a recent instance, in this State, (New York,) one reached the weight of nine pounds and three ounces, the fleece being of 11 months and 21 days' growth. This ram was three years old, weighed 108 pounds after shearing, and was in good condition. His unwashed fleece was 24 pounds. The *scoured* fleeces of full-grown American merino ewes frequently weigh from five to over five and a half pounds; the shorn carcases weighing from, say, 65 to 75 pounds. And it should be remarked that the heaviest fleeced sheep of the most celebrated flocks have, in very few instances, been entered in these scouring tests, for the reason, doubtless, that their owners have not been willing to risk their established reputation by any new or unnecessary experiments.

From the preceding facts it appears, first, that prime American merinos produced more *washed* wool in 1844–'46 than was produced of *unwashed* wool by the original stock in Spain, at their palmiest period, the opening of the present century; second, that prime American merinos produce about as much *scoured* wool now as they did of *washed* wool in 1844–'46, and nearly twice as much scoured wool as the picked merino flock of the King of Great Britain from 1798 to 1802.[2] They undoubtedly produce twice as much scoured wool as the average of the prime Spanish flocks at that period.

[1] The committee also appraised the value of the scoured wool, and presented various other comparative data of value, not necessary to be mentioned here.

[2] I take into account the wethers in the King's flock, which yield considerably more wool than ewes.

It remains to speak of the quality of American merino wool. From the best information I can obtain, the wool of the descendants of the original Spanish sheep imported into this country rather gained in quality between 1809 and 1824. This was undoubtedly true of the Jarvis and Humphreys stocks; and from 1824 to 1846 there was a more decided gain in this direction, owing to the taste for fine wools diffused by the prevalence of the Saxons. After 1846, for reasons already stated, the demand for broadcloth wools ceased, and our merino breeders sought a rather coarser and also a longer staple, because it was equally adapted to the fabrics in which it was thenceforth employed, and because much heavier fleeces could thereby be secured. It is now, in our heaviest fleeced flocks, too coarse for a good quality of broadcloths, and it is also quite too long for that purpose, two inches and a half being not far from the medium length, and wool three inches long being frequently met with. It has a remarkably strong staple, and is found admirably adapted to fine wool combing purposes and to those medium fabrics which constitute so large a proportion of the consumption of the United States.

In regard to the particular properties of our full blood and grade American merino wools, the executive committee of the National Association of Wool Manufacturers, the committee itself consisting of the most eminent and successful manufacturers in the United States, bore the following voluntary testimony in a public report made in 1866: "In a class of fabrics, entering perhaps more largely than any other into general consumption—that of flannels—the superiority due principally to the admirable adaptation of the common wools of this country, their strength and spinning qualities is so marked as almost wholly to exclude the foreign flannels. American fancy cassimeres compare favorably in finish, fineness, and strength, with those imported. Our delaines, owing again, in a great measure, to the excellence of our merino combing wool, surpass the fabrics of Bradford at the same price. The excellence of American shawls was admitted at the Great Exhibition in London." And they subsequently add: "It has been the experience of all nations, that the domestic supply of this raw material has been the first, and always the chief, dependence of its manufacturers, and the peculiar character of this material has impressed itself upon the fabrics which each country has produced. Thus, in the fine wools of Saxony and Silesia, we have the source of German broadcloths; in the combing wools of England, the worsteds of Bradford; and, in the long merino wools of France, the origin of her thibets and cashmeres. The peculiar excellencies of American wools have given origin to our flannels, our cassimeres, our shawls, and our delaines; and they give strength and soundness to all the fabrics into which they enter."

A gradually reviving demand for wool suitable for broadcloths and some other fine fabrics has led to the introduction, within a few years, of merinos of shorter and finer staple, from Silesia, in Prussia; sheep vastly superior to our former Saxons in size, constitution, and product of wool.

There are also Saxon sheep, so-called, of pure merino blood, in contiguous portions of western Pennsylvania, eastern Ohio, and the part of West Virginia which lies between those States, which furnish a very high quality of broadcloth wool. They too are larger, hardier, and yield more wool than the original Saxons imported in 1824–1828. But any account or description of these families does not come within the province of this paper.

CORTLAND VILLAGE, *New York*, *July*, 1868.

APPENDIX B.

THE ANGORA GOAT; ITS ORIGIN, CULTURE, AND PRODUCTS.[1]

By John L. Hayes,

Secretary of the National Association of Wool Manufacturers.

The Jardin des Plantes, the source and model of our societies of natural history, gave to the world not only Buffon and Cuvier, who, by their brilliant labors, won for the researches of the naturalist a place in the domain of science, before accorded only to studies of the imponderable elements, but two other scarcely less illustrious naturalists, whose labors were inspired by the purpose of applying their favorite science to increase the material resources of man. To this idea France owes the merino sheep with which Daubenton endowed her, and the Imperial Society of Acclimatation, the creation of Geoffroy St. Hilaire, which aims to submit to practical study all the animals by whose acquisition the geographical zone of France can be advantageously augmented. Trusting that this society may regard with favor the discussion of a subject akin to those which have received the attention of the great practical naturalists of France, I propose to submit a memoir upon the Angora goat, the last acquisition which our agriculture and manufactures have received from the animal kingdom.

When we reflect that of the numerous species which compose the animal kingdom 43 only are at the command of man, and that the only lanigerous animal extensively appropriated in this country, besides its product of food, has furnished in a single year, from domestic sources, 70 per cent. of the raw material for a manufacture valued at over $120,000,000, we must regard the acquisition of a new animal, producing food and material for clothing, as an epoch in the industrial history of the country. It is the peculiar province of a society like this to aid the development of this new national resource by shedding the fullest light upon the specific and geographical source of this animal, upon its habits, food, and diseases, the use of its products, and, above all, upon the laws which govern its reproduction; in a word, to make upon this subject natural history *applied*. As my object is less to present original matter than to diffuse the best authenticated information, corrected by your criticism, or sanctioned by your approval, a work rendered necessary by the errors abounding in agricultural reports and publications, I shall avail myself of the memoirs of M. Brandt, M. Tchihatcheff, M. Sace, and M. Boulier, naturalists of high repute, and the very numerous notices scattered through the proceedings of the Imperial Society of Acclimatation.

The description of this animal, given in 1855, by M. Brandt, director of the Museum at St. Petersburg, and distinguished among the zoologists

[1]Read before the Boston Society of Natural History, March 18, 1868.

of Europe for his conscientious work and profound knowledge, is as follows: "The magnificent example of the Angora goat, which the Museum of the Imperial Academy owes to M. Tchihatcheff, produces at first sight the general impression of a domestic goat, when attention is not directed to its thick and silky fleece, to its flat ears turned downwards, and its inconsiderable size. But it is precisely these traits which impress upon this animal a distinct seal, which give it the character of a peculiar race, whose origin is perhaps not the same as that of the domestic goat. The extremity of the snout, the cheeks, the nasal and frontal bone, as well as the ears, and lower part of the legs below the tarsal articulation, are covered with external hairs, which are shorter and thicker than those which cover the above-mentioned parts in other species of goats. The forehead has soft hairs of less length, less applied to the skin, and, in part, curled. The hair of the beard, which is pointed and of moderate dimensions, being six inches in length,[1] is stiffer than the hair of the rest of the body, but less so than that of the beard of the ordinary goat. The horns, of a grayish white tint, are longer than the head; at their lower part the interior marginal border turns inwards in such a manner that in this part they appear broad viewed in front, and narrow when seen exteriorly; at half their extension they direct themselves moderately backwards, and turn spirally outwards, so that their extremities, directed slightly upwards, are very much separated one from the other, and circumscribe a space gradually contracting itself. The whole of the neck, as well as the trunk, is covered with long hairs, which, particularly upon the neck and lateral parts of the body, are twisted in spirals having the appearance of loosened ringlets, it being observed at the same time that they unite themselves into rolled tufts, a disposition which is less marked in the anterior part of the neck. The hairs which exhibit the greatest length are situated above the forelegs, and are almost nine and one-half inches long. Those of the neck are a little shorter and are nine inches long, and those of the belly eight inches three lines. The length of the hair with which the lateral parts of the body, as well as the back, are covered, is only seven inches six lines, and that of the hair of the hind legs six inches to seven inches. Finally the slight stiff hair of the tail is about four inches in length. The color of the robe of the animal is a pure white, here and there slightly inclining to yellow. The hoofs, somewhat small in proportion, are, like the horns, of a grayish white tint. The hair is, without exception, long, soft, and fine; it is at once silky and greasy to the touch, and shows distinctly the brilliancy of silk."

M. Brandt observes that the hairs corresponding most to external hair have only a third, or at most do not attain half, the thickness of the external hair of the common goat; and that the external hair of the wild and domestic goats is not only closer, stiffer, and more massive, but has a more considerable torsion and a less even surface; that is to say,

[1] All the dimensions given by M. Brandt are in German measurement. One German foot is equal to 1.0299 English feet.

it is rougher and more scaly. He also remarked that "the walls of the hair of the Angora goat being thinner than those of the hair of the common goat, the substance contained in the fatty cellules oozes out more readily, which renders the hair of the Angora goat softer and more flexible, and gives it the lustre of silk."

M. Brandt omits to mention that the long ringlets cover the hair, properly called, which is rough and short and lies sparingly upon the skin.

The dimensions of the specimen examined by Mr. Brandt are given by him as follows:[1]

	Ft.	*in*	*l.*
From the point of the snout to the root of the tail	5	4	2
Length of head		11	9
From the point of the snout to the eye		5	1
From the eye to the ear		2	5
From the eye to the horns		1	9
Length of ear		6	0
Length of horns in direct diameter	1	2	0
Length of horns following the curvature	1	6	6
Distance between horns taken at their roots		2	1
Distances between their terminal points	1	9	9
Width of horns at their roots		2	1
Length of tail, including the hair		9	9
Height of anterior part of the body	2	2	4
Height of posterior part of the body	2	2	2

The point of inquiry most strictly pertinent to the objects of this society, and one at the same time eminently practical, as indicating the laws which govern the reproduction of this animal, thus illustrating the relations of pure science with utilitarian ends, is the determination of the specific source of the Angora goat.

The popular opinion as to the origin of this species is founded upon the authority of Cuvier, who mentions but three species of the genus *Capra—Capra ægagrus, Capra ibex, Capra caucasica.* He says: "*Capra ægagrus* appears to be the stock of all the varieties of domestic goat;" adding that they vary infinitely in size and color, in the length and fineness of the hair, in the size of the horns, and even in the number; the Angora goats of Cappadocia having the largest and most silky hair.[2]

The more recent researches of zoölogists have greatly developed the knowledge of this genus. Instead of three only there are now recognized nine species of wild goats, which are divided into two groups based upon the form of the horns:

1. Group with horns flat in front, having a hori- { Capra ibex. Capra hispanica. Capra pyrenaica.

[1] Bulletin de la Société Impériale d' Acclimatation, t. ii., pp. 316–18.

[2] Animal Kingdom, McMurtrie's Translation, vol. i., p. 198.

zontal triangular section, and furnished with large transversal knots. { Capra caucasica. Capra sibirica. Capra Walei. Capra Beden.

2. Group with horns compressed and carinated in front. { Capra Falconeri. Capra ægagrus.[1]

The so-called goat of the Rocky mountains is removed by Professor Baird from the genus *Capra*, where it was formerly placed by him under the designation of *Capra Americana*, mountain goat. He says in the description of *Apocerus montanus*, contained in his Report of the Zoölogy of the Pacific Railroad Routes: "The figures and description of the skull and other bones of this species by Dr. Richardson show very clearly that the affinities are much more with the antelopes than with the goats or sheep.

[1] Essai sur les Chèvres par M. Sacc. Bulletin supr. cit., t. iii., pp. 519, 561; t. iv., p. 3 Giebel.

NOTE.—THE CASHMERE GOAT.—The only goat besides the Angora which is strictly lanigerous is the Cashmere or Thibetian goat, which abounds in central Asia, but whose origin is still obscure; although it has, according to Brandt, affinities with the Angora race. The size of the Cashmere goat is quite large; the horns are flattened, straight and black, and slightly divergent at the extremities. The ears are large, flat, and pendent. The primary half, which is long, silky, and lustrous, is divided upon the back, and falls down upon the flanks in wavy masses. Beneath this hair there is developed in the autumn a short and exceedingly fine wool, from which the famous Cashmere shawls are fabricated. The enormous price of these shawls when extensively introduced into France at the commencement of the present century, as high as 10,000 or 12,000 francs, stimulated the French fabricants to emulate the Indian tissues. The first yarns from Cashmere wool were spun in 1815, and the high numbers were worth eight dollars per pound. The peculiar Indian texture called "Espoulino" was perfectly achieved; and the success in this manufacture was hailed as the most brilliant triumph of the textile industry of France. Under the patronage of Monsieur, afterwards Charles X, in 1819 a great number of these goats were imported from Thibet, as many as 400 being introduced by one manufacturer, Baron Ternaux, and much enthusiasm was excited in their culture. Experience, however, proved that these goats yielded but little milk, and that the raw wool or down produced from an individual never exceeded 108 grams, usually much less, which it was very difficult to separate from the coarse hairs, "yarre," and yielded not more than 25 per cent. of material which could be woven. The manufacturer also discovered, although they had overcome all the mechanical difficulties of fabrication, that the raw material, expensive as it was, formed not more than one-tenth of the cost of a shawl; that the Indian weaver worked for one-fifth the wages of a French workman, and that the ladies of fashion would pay double price for an Indian shawl, inferior in color, design, and texture to the French fabric. The manufacture, which employed 4,000 workmen in 1834, began to decline in 1840; and, although an occasional fabric may still be made, the manufacture has now ceased as a regular industry. The demand for the wool ceasing, the Cashmere goats became absorbed in the common race, and there is at present but a single flock of pure blood in Europe; the one preserved is the remarkable collection of domestic animals possessed by the King of Wurtemberg. There is reason to believe that the culture of the Cashmere goat will never be revived in Europe as a matter of profit, since a perfect substitute for the Cashmere down is found in the silky fleece of the new Mauchamps sheep, which is declared to be fully as brilliant and fully as soft as the product of the Cashmere goat, while it costs less as a raw material, and requires less manipulation to be transformed into yarn. (Sacc, sur les Chèvres. Bulletin supr. cit., t. iv., p. 48. Industrie des châles. Travaux de la Commission Français, p. 10. Bernoville, Industrie des laines Peignées, p. 161.)

In fact, none of the more modern systematic writers place it in the genus *Capra*, or, indeed, in the ovine group. The mere general resemblance, externally, to a goat is a matter of little consequence; indeed, its body is much more like that of a merino sheep. The soft, silvery, under hairs are very different from those of a goat, as well as the jet black horns, which are without any ridges, and smooth and highly polished at the extremities."[1]

The more recent investigations have shown that the animals referred to, and figured by G. Cuvier and F. Cuvier as types of the *Capra ægagrus* or Paseng, and said to occur both in Persia and on the Alps, were domestic goats which had become wild. Later researches have determined the true characteristic of *Capra ægagrus*, a species formed by Pallas from a cranium only, received by Gmelin from the mountains of the north of Persia, and have shown that naturalists had adopted this species as the source of the domestic goat without resting the assertion upon any proof. The comparison by M. Brandt in 1848 of a collection of skulls and horns obtained by M. Tchihatcheff in the Cappadocian Taurus, with the original cranium which served Pallas for the type of his species, has enabled that naturalist, for the first time, to demonstrate positively the derivation of our domestic goat from *Capra ægagrus*. M. Brandt asserts that it results from his labors that this species "is incontestably and exclusively the source of the domestic goat of Europe," and gives the following arguments in support of this assertion:

1. "The *Capra ægagrus* has all the exterior forms and all the proportions of the domestic goat."

2. "It resembles it very much in the general as well as local distribution of its colors."

3. "It approaches the domestic goat more than any other species in the configuration of its horns, a configuration which plays so important a part in the characteristics of the wild species."

4. "It presents the same agreement with the domestic goat in respect to the cranium. Finally, it is found in the mountains of the countries, especially Mesopotamia, inhabited by the people of antiquity, (the Israelites, Assyrians, &c.,) which have furnished the most ancient information respecting the raising of the goat."[2]

The establishment of the perfect identity of the domestic goat with a wild species is a negative argument of much force for the exclusion from the same source of an animal so widely differing as the Angora goat. A positive argument of equal weight is the recent observation that the Angora goat more nearly resembles another wild species lately discovered. This species, the *Capra Falconeri*, is found upon all the mountains of Little Thibet, and upon the high mountains situated between the Indus, the Badukshan, and the Indo Kusch. It resembles greatly the domestic

[1] Vol. vii, p. 672.

[2] Considerations sur la Capra ægagrus de Pallas, souche de la Chèvre domestique, par. J. F. Brandt. Bulletin supr. cit., t. ii, p. 565.

goat, from which it differs principally in its magnificent horns, which, near together at the base, are at first arched backwards, and then turn in a spiral inwards, and then over again outwards. They are strongly compressed, triangular and free from knots; their internal face, at first plane, is rounded higher up, whilst their external face is everywhere convex. Although there does not appear to be a development of fleece in this wild species corresponding to that of the Angora goat, M. Sace, professor in the faculty of sciences at Neuchatel, who has made a special study of the goats, does not hesitate to declare that "all the characters of this species seem to indicate that it is the source of the beautiful and precious Angora goat, whose horns are spirally turned like those of Falconer's goat." M. Brandt intimates that the domestication of other wild species than *Capra ægagrus* and perhaps the *Capra Falconeri* had produced the Angora goat. Geoffrey St. Hilaire, the highest authority upon the origin of domestic animals, refers to the opinions of M. Sace and M. Brandt without dissent, thus: "He (M. Brandt) is led especially to see in the Angora goat, produced, according to Pallas, by the cross of the sheep with the goat, an issue of the *Capra Falconeri;* this opinion is also admitted by our learned confrere, M. Sace."[1]

The hypothesis that the Angora goat is descended from Falconer's goat is rendered probable by the diffusion of the former around the mountains of Thibet, where Falconer's goat abounds, and even beyond the central plains of Asia from Armenia to Chinese Tartary, where its wool is manufactured, or exported in a natural state by the port of Shanghae. Angora wool, or mohair, was exhibited at the London Exhibition of 1862 among the Russian products, as proceeding from the country of the Kalmucks of the Don, situated between the Black and Caspian seas. This species is thus seen to be diffused, although it may be sparingly, over the whole surface of Asia.

That this goat is at present more abundant in the country about Angora in Asia Minor, near the habitat of the *Capra ægagrus* and distant many thousand miles from Thibet, may seem opposed to its derivation from the Thibetian species. The learned memoir of the Russian traveller, M. Tchihatcheff,[2] establishes beyond question the comparatively recent introduction of the Angora goat into Asia Minor. He has shown that among the countries of classic antiquity there is no one which the ancient writers have mentioned more frequently and under more varied aspects than Asia Minor, because this country was not only one of the foci of the Greek civilization, but also the native country of a great number of the most celebrated writers of antiquity, such as Herodotus, Homer, Strabo, Dion of Halicarnassus, Galen, &c. Hence in all that concerns the natural history of Asia Minor, the writings of these authors have an especial interest, while their silence has the value of a negative argument. Referring to the writings anterior to the classic period, we

[1] Sur les origines des animaux domestiques. Bulletin supr. cit., t. vi, p. 503.

[2] Considerations sur la chèvre d'Angora. Bulletin supr. cit., t. ii, p. 411.

find in the most ancient and venerable of historic monuments, the Bible, that the goat is frequently mentioned among the domestic animals which constituted the riches of the first patriarchs. Yet there is nothing in these notices which leads us to suppose that they were possessed of a race with fine and white wool. The beautiful comparison in the Song of Solomon which might seem to suggest the existence of a choice race of these animals, "Thy hair is as a flock of goats that appear from Mount Gilead," taken in connection with the verse following, "Thy teeth are like a flock of sheep that are shorn, which came up from the washing," would seem to intimate that the color was referred to by the poet as the point of resemblance; while the first comparison, to be flattering to youthful beauty, must imply that the color was black and not white.

Coming down to the Greek authors—Homer and Hesiod, though frequently mentioning the goat as a domestic animal, make no allusion to any particular race. Ælian, referring to the goats of Lycia and the practice of shearing them like sheep, says that the wool is used for cords and cables. Appian mentions the stuffs known under the name of *Κιλίκια* from Cilicia, the ancient name of the country in which Angora is situated, as a means of protection against projectiles; implying that the tissues of the goats of Cilicia were not distinguished for their fineness. Virgil gives the wool of the goat no other destination than to serve for the necessities of the camp and for the use of poor sailors:

"Usum in castrorum et miseris velamina nautis."

Columella, the great writer on Roman agriculture, quotes this line of Virgil as applicable to the covering of goats, and while tracing the qualities which a perfect animal should possess, excludes all resemblance to the Angora goat by demanding that the hair should be black. Strabo, born in the town of Amasia, very near the present domain of the Angora goat, makes no mention of goats of that country distinguished for their fleeces, although he remarks upon the different races of fine wooled sheep found in many places in Asia Minor. The author whom I am following observes that the most careful research among the Byzantine writers, after the Roman possessions became the patrimony of a barbarous people, has not afforded the least indication of a fine and white wooled goat. It was not until the year 1555 that the Angora goat was distinctly made known through the Father Belon, who had travelled in Asia Minor, by a brief but sufficiently characteristic description. The silence of the classic authors in respect to any goat with fine and white fleece would seem to place it beyond doubt that the progenitors of this animal were introduced into Asia Minor at a comparatively recent period, when the country was invaded by barbarous and pastoral races, either Turks or Arabs. M. Tchihatcheff observes that the Arabs have never formed stable establishments in Asia Minor, while the Turkish race is the only one among the modern invaders of that country which came in search of a permanent home and has preferred it unto this day. He shows that two branches of the Turkish race, the Suldjeks and the Oghus, suc-

cessively installed themselves in Asia Minor in the eleventh and thirteenth centuries, taking possession of the precise region in which Angora is included, and which their descendants still occupy. Immediately previous to their immigration they had occupied the vast plains of Khorassan and Bokara, and still more anciently, according to the most celebrated orientalists and geographers, the country on the southern borders of Siberia and the mountains of the Altai chain. It appears thus to be not improbable that a race of animals, originating in Central Asia, whose representative still exists in the *Capra Falconeri*, should have been carried by the migration of pastoral tribes to the region in which they are now found in the modified form of the Angora goat. This hypothesis is supported by the statement of the President de la Tour d'Aigues, probably derived from the Turkish shepherds who accompanied the flock introduced by him into Europe in 1787, that "there is a constant tradition that the goats of Angora did not originate in that country, but were derived from Central Asia."[1]

Although the origin of the Angora goat from Falconer's goat is not demonstrated by proofs as positive as those which support the derivation of the common goat from *Capra ægagrus*, they are not less positive than those which formerly led all naturalists to attribute the paternity of the common goat to that species. The absolute knowledge of the progenitor of the Angora goat is of less practical importance than the demonstration of a specific difference between the two races. That the Angora goat constitutes a particular race, and is not due to the same origin as the common goat, seems established by the following considerations:

1. There is an essential difference in the horns of the two races, those of the Angora race being twisted spirally, a configuration wholly wanting in the common race, the form of the horns being recognized by modern systematic writers as the basis of the classification of the family *Cavicornia*, or ruminants with horns permanent, hollow, and enclosing a piece of the frontal bone.

2. The mammillary organs are hemispherical, while they are elongated in the common species.

3. The very long woolly hair, hanging in corkscrew ringlets, fine, white and lustrous as silk, covering the short and harsh hair properly so called, which lies upon the skin, is in striking contrast with the short and coarser external hair of the common goat with its finer interior hair or down.

4. The cry, wholly different from that of the common goat, resembles that of sheep.

5. The milk is more fatty; the odor of the male less strong and disagreeable.

6. The Angora, like the common goat, is fattened as readily as the sheep, and the flesh is exceedingly palatable.

7. The specific difference is finally established by the character of the crosses, a point to be referred to hereafter with more detail.

[1] Sacc, Essai sur les Chèvres. Bulletin supr. cit., t. iv, p. 6.

The theory of the difference of species in these two races is not invalidated by the fertility of the products of their crosses; such fertility having been observed in the mixed offspring of the more widely separated species, the horse and the ass. In this case it is well established that the he mule can generate and the she mule produce, such cases occurring in Spain and Italy, and more frequently in the West Indies and New Holland.[1]

The practical deduction to be drawn from the separation of the two species is thus clearly stated by M. Sace: "There is then no utility in creating flocks of the Angora for crossing with the ordinary goat. We must limit ourselves to preserving the species in entire purity and devote ourselves to improving the race by itself, as has been done with the justly celebrated merinos of Rambouillet."[2] A leading object of this paper is to enforce the opinion of this sagacious and practical naturalist.

Upon the introduction of the Angora goat into France in 1787, and more recently in 1855, the opinion was generally entertained that the principal benefit to be derived from the new race would result from the amelioration of the products of the common species. This opinion unfortunately prevails in this country. It is sanctioned by all the agricultural notices or essays which have been published respecting the new race, and is naturally fostered by importers and breeders to enhance the selling price of bucks.

One of the earliest papers descriptive of this species which appeared in this country was published in the Patent Office Agricultural Report for 1857,[3] it being the abstract of a report upon the Cashmere goats, as they were called, in the possession of Mr. Richard Peters, of Atlanta, Georgia, written by the well-known naturalist, Dr. John Bachman, of Charleston, South Carolina. This excellent naturalist, repeating the views at that time entertained, says: "The varieties of goats are equally numerous and equally varied in different countries. They are all of one species, the varieties mixing and multiplying into each other *ad infinitum*. They all claim as their origin the common goat, *Capra hircus*, which it is admitted by nearly all reliable naturalists derives its parentage from the wild goat, *Capra ægagrus*, that still exists on the European Alps." After referring to the diversity of color, aspect, and form, seen in the goats of Hindostan, Chinese Tartary, and Thibet, he says: "In a word, they are all of one species, but under many varieties; breeds have become permanent, and some are infinitely more valuable than others." He gives the results of breeding the Angora with the common goat as shown in the flocks of Mr. Peters in the following language: "Familiar as we have been through a long life with the changes produced by crosses among varieties of domestic animals and poultry, there is one trait in these goats which is more strongly developed than in any other variety that we have ever

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[1] Lyell's Principles of Geology, vol ii, p. 423.

[2] Bull. supr. cit., t. v., p. 571.

[3] P. 56.

known. We allude to the facility with which the young of the cross between the male of the Asiatic goat and the female of the common goat assume all the characteristics of the former. It is exceedingly difficult to change a breed that has become permanent in any of our domestic varieties, whether it be that of horses, cattle, sheep, or hogs, into another variety by aid of the male of the latter. There is a tendency to run back into their original varieties. Hence the objection to mixed breeds. But in the progeny of these Asiatic and common goats, nine-tenths of them exhibit the strongest tendency to adopt the characteristics of the male, and to elevate themselves into the higher and nobler grade, as if ashamed of their coarse, dingy hair, and musky aromatics, and desirous of washing out the odorous perfume and putting on the white livery of the more respectable race." Speaking of the Angora goat, Mr. Israel S. Diehl, who has contributed a paper upon it of much research, and valuable for many original observations, says:[1] "This goat, though described as the *Capra Angorensis*, is only an improved variety of the *Capra hircus*, or common domestic goat." He refers to numerous State agricultural societies and scientific and practical men to show the value of the Angora goat and its fleece, "and the facility with which it can be crossed and bred with the common goat, by which a flock can be readily raised and increased," adding, "almost all the progeny exhibit the strongest tendencies to the higher and nobler grades by assimilating themselves to the male and putting on the white livery of the more respectable, honored, and valued race." These views, widely circulated through the government agricultural reports, have been accepted without question, and the efforts of breeders in this country have been largely wasted in vain efforts to produce crosses which would have all the value of the pure race.

To judge of the value and feasibility of such attempts we must bear distinctly in view the precise economical result to be sought for. It is obviously not primarily to obtain a breed of goats which shall be fit for the butcher. Neither is it to secure a breed which will furnish a merely tolerable fleece which would be simply a substitute for the wool of the sheep. The object is to appropriate a race of animals which shall produce a textile material adapted for certain defined purposes in the arts as distinct as silk, noble Saxony wool, or sea-island cotton; a material which is substitute for nothing else known, and has originated its own fabrics. The introduction of a race which fails to give this peculiar fibre would be no real acquisition, however amusing to the breeder and interesting to the physiologist the experiments in crossing might be.[2]

[1] Report of the Department of Agriculture for 1863, p. 216.

[2] The conviction is extending among intelligent wool growers in this country of the importance of preserving the varieties of woolly fibre, each in its own character, purity, and excellence, and free from that "mongrel type which will *do* for everything, but is *not desirable* for anything." At a meeting of the Ohio Wool Growers' Convention, January 7, 1867, "Mr. R. M. Montgomery moved that the true course in breeding sheep is to keep breeds entirely distinct and to endeavor to produce the best clothing of the best combing wools, which proposition was unanimously agreed to."—U. S. Economist, January 25, 1868.

Laying aside the statements given in the agricultural reports, as of little value as testimony, because there is no matter in which even skilful flock breeders are so liable to be deceived as in the character and adaptation of their fleeces, and because there is no evidence that the products of the crosses referred to have ever been subjected to the only conclusive test, that of spinning, let us consider the feasibility of producing the typical fleece of the Angora goat by means of crosses, by reference to admitted physiological principles, and the results in analogous cases. The illustrious naturalist, M. de Quatrefages, who has recently discussed, in his lectures at the Muséum d'Histoire Naturelle, and in the Revue des Deux Mondes,[1] the principles which govern the formation of races, remarks that "there is one law in crossing which is constantly verified: each of the two authors tends to transmit to the products at the same time all its qualities good or bad." This tendency he admits is modified by the predominance, in one or the other, of the power of transmissibility. "When this power is equal in the two parents the product will have an equal mixture of the qualities of the parents; there will be a predominance of the qualities of one where this power of transmissibility is unequal. The inequality of the power of transmissibility appears to be much greater when the races are nearest each other, for sometimes the crossing between such races gives a product which seems to belong entirely to one of the two."[2] He observes that it follows from these principles that nothing could be more irrational than to take animals of the half blood as regenerators to ameliorate a race; for not possessing completely the qualities which we seek, and having preserved a part of the bad which we wish to shun, they transmit a mixture of one, and besides, as they are necessarily of a formation more recent than the race to be regenerated, it will be the last one which will impress itself, if not upon the first, at least upon successive generations. These views are confirmed by the recent observations of Professor Agassiz in Brazil on the effects of crosses of races of men. He observes that the principal result at which he has arrived from the study of the mixture of human races in the region of Brazil is that "races bear themselves towards each other as all distinct species; that is to say, that the hybrids which spring from the crossing of men of different races are always a mixture of the two primitive types and never the simple reproduction of the characters of one or the other progenitor." It is also remarked by the same high authority, that, "however naturalists may differ respecting the origin of species, there is at least one point in which they agree, namely, that the offspring from two so-called different species is a being intermediate between them, showing the peculiar features of both parents, but resembling neither so closely as to be mistaken for a pure representative of the one or other."[3]

[1] *Vide* Revue des Deux Mondes, December 15, 1860, to April 14, 1861.

[2] Amelioration de l'espécé chevaline, Bull. supr. cit., t. viii, 1861, p. 257.

[3] A Journey in Brazil, by Professor and Mrs. L. Agassiz, pp. 296 and 338.

The views of the eminent physiologists above quoted give no support to the popular fallacy into which Dr. Bachman and Mr. Diehl seem to have fallen, that the male animal possesses the greater power of transmitting blood to his progeny. Dr. Randall, in the chapter upon the principles of breeding in his "Practical Shepherd," while admitting that the ram much oftenest gives the leading characteristics of form, attributes the greater power of the ram to the superiority of blood and superiority of individual vigor, as the ram is generally "higher bred" than the ewes, even in full blood flocks.[1]

If it be true as a physiological principle that the parents in widely separated races tend equally to transmit all their qualities, what hope is there of obtaining a valuable lanigerous animal from the crosses of goats so widely separated as to belong to different species; especially when the heavy coating of one is absolutely worthless, and nothing short of the peculiar qualities found in the other is worth seeking for? All analogy teaches that it is vain to expect to form a permanent race of any value from the crosses of such widely separated races. Dr. Randall declares that "all attempts to form permanent intermediate varieties of value by crosses between the merino and any family of the mutton sheep with the view of combining the special excellencies of each have ended in utter failure."[2] The German breeders say that it is impossible to transform, by crossing, the common sheep into merinos. Even after nine generations the common type reappears as soon as the use of merino rams of the pure blood has ceased.[3] It is for this reason that the Germans refuse to the highest bred grade any other designation than improved half breeds.[4]

The constant use of regenerators of pure blooded Angoras, if they could be procured, which would soon be impossible, from domestic sources, if the system of crossing should be persisted in, would be of little avail. In the Asiatic goat we have a perfect standard, as in the Arabian horse. Mr. Youatt says of the English races of the horse descended from the Godolphin Arabian, or the Darley Arabian and the blood mares of Charles I, "where one drop of common blood has mingled with the pure stream, it has been immediately detected in the inferiority of form and deficiency of bottom."[5] So, we may infer, will a drop of blood of the common goat detract from the lustre and fineness of fibre found in the pure Asiatic race.

The elaborate article of Mr. Fleischman on German fine wool husbandry[6] gives the results of constantly regenerating by the pure merino ram, the cross from the pure merino and common country sheep. At the fourth generation the fleece consists of 25 per cent. *prima*, 50 per cent. *secunda*, and 25 per cent. *tertia* wool. The nature of the wool is

[1] Pp. 110, 111.
[2] The Practical Shepherd, p. 125.
[3] Sacc. Bull. supr. cit., t. v, p. 571.
[4] Practical Shepherd, p. 127.
[5] Youatt on the Horse.
[6] Patent Office Report, 1847, p. 253.

still coarse. There are about 18,000 wool hairs in a square inch. In the tenth generation the fine wool predominates. A fleece yields from 60 to 70 per cent. *prima*, 20 to 25 per cent. *secunda*, and 10 to 15 per cent. *tertia* wool. In the twentieth generation the fleece, by regular crossing and careful management, has 20 per cent. *electa*, 50 per cent. *prima*, 20 per cent. *secunda*, and 10 per cent. *tertia* wool. There will yet be sometimes found *stickel* or coarse hair. At this period 27,000 wool hairs grow upon a square inch. Thus even at the twentieth generation, with the constant use of regenerators of the pure blood, the wool falls short of the fineness of the original or perfectly pure blooded animal, which has from 40,000 to 48,000 wool hairs on a square inch. These facts show how slow is the approach to fineness of fibre even in crosses of animals descended from a remote though common ancestor.

Proceeding from analogy to direct evidence as to the results of breeding the race under consideration by means of crossing with the common species, no person in Europe has examined the Angora goat so thoroughly and for so long a period as M. de la Tour d'Aignes, president of the Royal Society of Agriculture of France, who, in 1787, introduced some hundreds of these goats into Europe under the care of Turkish shepherds, and established them upon the low Alps, where they greatly prospered. He affirms that even after the sixteenth generation the hair of the crosses obtained by crossing the Angora buck with females of the common goat remained hair, and although it was elongated it could not be spun.[1] "This species is," he says, "constant; and although they procreate with our goats we can never hope to multiply them by crossing the races, because the vice of the mother is never effaced. If some individuals approach, more or less, the race of the sire, the hair will always be shorter and too coarse to be worked."[2] The testimony of this official head of the agriculture of France is of the highest value, not only because his position led him to seek the utmost advantage from the introduction of a new race, but because an elaborate memoir published by him shows that he had made thorough experiments in spinning and manufacturing the products of his fleeces, for which he gives minute directions.

The observations of M. Brandt show that the thickness of the hair of the pure Angora goat is from a third to a half that of the common goat. This fineness of fibre is an essential spinning quality. The fibre of this species is always prepared and spun in the form of worsted of long wool, that is, the fibre is not carded or subjected to a process by which the fibres are placed in every possible direction in relation to each other, adhering by their serratures, but are drawn out by combing so that they may be straight and parallel, the ends of the fibre being covered in the process of spinning, so that the yarns are smooth and lustrous. The fibres being extremely slippery they will not adhere in spinning unless they have the requisite fineness to permit many parallel fibres to be

[1] Saac Bull. supr. cit., l. v, p. 570.
[2] Sacc Bull. supra. cit., l. iv, p. 8.

united in a yarn of a given number. When the fibres are too large they require to be mixed with combing wool to "carry" the fibre, as it is technically called, which diminishes the lustre of the fabric. Manufacturers of worsted, who have had large experience in spinning the mohair of Asia and this country, inform me that the best mohair can be spun into yarns of the number 42, while others are with difficulty spun into yarns numbered from 10 to 16. Fibre of the latter quality is of no more value than the most ordinary combing wool, except for a few exceptional purposes, to be hereafter referred to. Lots of so-called Angora wool, doubtless the products of recent crosses, offered in the market the present season, could be used only for carpet filling, the lowest use of woolly fibre.

Although the facts and reasoning given above leave no doubt upon my own mind that the breeding from crossings of the common goat of this country should be abandoned, it is proper that I should state that hopes are still entertained in France of good results from breeding with the domestic goats of that country. M. Richard, of Cantal, in a report made in 1862 upon the animals deposited by the Society of Acclimatation at the farm of Souliard, in the Cantal, says: "Crosses produced from the Angora and the ordinary goats of Auvergne have given products, which at the second generation much resemble those of pure blood; and if the society should continue its experiments upon this subject, I think it will obtain some happy results. Nevertheless, to settle the opinion upon this point, it would be useful to study this practical question wherever the Angora goats have been deposited."[1] The most that can be made of the opinion so cautiously expressed is that the system of crossing is still regarded in France as a proper subject of experiment.

CULTURE IN THE REGION OF ANGORA.

The culture of this species in the country of its greatest development next demands attention. Ample information upon this point is furnished by scientific travellers. The celebrated academician Tournefort, the master in botany of the illustrious Linnæus, was the first to shed full light upon the ancient magnificence of Ancyra, the site of the present Angora, mentioned by Livy among the illustrious cities of the east. He refers to its most ancient people as having made even the kings of Syria their tributaries, while its later inhabitants were the principal Galatians, whom the Apostle Paul honored with an epistle. He describes its monument to Augustus, the most splendid in all Asia, upon which was inscribed in pure latin the life of the emperor, its streets abounding with pillars and old marbles mingled with porphyries and jaspers, its walls built up of ruins of architraves, bases and capitals, and its tombs covered with Greek and Latin inscriptions, all attesting that this was one of the centres of the Roman civilization, and making more significant the silence of contemporary authors before alluded to. But more interesting than the monuments of past splendors is the mention, first given

[1] Bulletin, supr. cit., t. ix, p. 8.

with any detail by this traveller, of the contribution to modern civilization made by the barbarians from Central Asia. I transcribe his language:

"They breed the finest goats in the world in the champaign of Angora. They are of a dazzling white, and their hair, which is fine as silk, naturally curled in locks of eight or nine inches long, is worked up into the finest stuffs, especially camlet. But they do not suffer these fleeces to be exported from this place, because the people of the country gain their livelihood thereby. * * * However it be, these fine goats are to be seen only within four or five days' journey of Angora and Beibazar. Their young degenerate if they are carried further. The thread made of this goat's hair is sold for from four livres to 12 or 15 livres the *ocque*. Some is sold for twenty and five-and-twenty crowns the ocque, but that is only made up into camlet for the use of the Sultan's seraglio. The workmen of Angora use this thread of goat's hair without any mixture, whereas at Brussels they are obliged to mix thread made of wool, for what reason I know not. In England they use up this hair in their periwigs, but it cannot be spun. * * * All this country is dry and bare except the orchards. The goats eat nothing except the young shoots of herbs, and perhaps it is this which, as Brusbequis observes, contributes to the consummation of the beauty of their fleece, which is lost when they change their climate and pasture."[1]

Interesting statements in relation to the culture of this species at Angora are given by Captain Conelly, an English traveller, in a paper read before the Asiatic Society, which I deem it unnecessary to repeat, as they are generally accessible in Mr. Southey's work on wool.[2] The most recent information is that given by the Russian traveller before quoted, who devoted five years to the study of natural history in Asia Minor, and M. Boulier (Pharmacien Aide Major) in a report of a mission to Asia Minor presented to the French minister of war.[3] The region marked out by the former of these scientific travellers, as the peculiar domain of the Angora goat, is situated between 39° 20′ and 41° 30′ north latitude, and between 33° 20′ and 35° longitude east of Paris, a surface of about 2,350 metric leagues square, equivalent to about a forty-fourth part of the surface of the peninsula of Asia Minor, and about the same fraction of the area of France. This country is more or less mountainous and furrowed by deep valleys, its mean altitude being estimated at 1,200 metres; while the more elevated masses are generally shaded with fine forests, the plateaus, which form a large part of the country, are very little wooded. The absence of trees, bushes, and arborescent plants gives the country the aspect of immense steppes. This nudity permits the first heats of the spring to dry up the little humidity which the earth

[1] A Voyage into the Levant. By M. Tournefort, Chief Botanist to the French King.

[2] Southey on Colonial Wools, p. 322 *et seq.*

[3] Vide Considérations sur la chèvre d'Angora, par M. P. de Tchihatcheff, Bull. supr. cit., t. xi, p. 305. Sur la chèvre d'Angora, par M. Boulier, Pharmacien Aide Major. Bull. supr. cit., t. xi, p. 557.

has acquired in winter. The climate is excessive, the winters being very cold, and the summers exceedingly hot. The country is covered with snow in winter, the rain and snow being very frequent, the thermometer in the neighborhood of Angora frequently descending to —12° —15° —18° of the Centigrade thermometer, corresponding to 10.6°, 5°, and zero Fahrenheit.

The cold season continues, however, only three or four months. During the rest of the year the temperature is very hot, particularly in the valleys, while the fine days continue almost without interruption; abundant pasturage is found for the white goats only after the frosts and snows, when the first warm rains revive the vegetation. This time is of short duration, and the stimulus given by a copious and succulent nourishment is exerted wholly in developing the fleeces in length. The shearing, which takes place in April, is hardly concluded when the vegetation called forth by the warm spring is arrested, and receives no moisture from the dews, persons lying at night in the open air finding in the morning no humidity upon their garments. This dryness, however, gives to the vegetation which flourishes, the only aliment to flocks during summer, an aromatic character which makes it peculiarly digestible and stimulating.

The mineralogical character of the rocks which underlie the country is generally feldspathic, the trachytic and serpentine rocks abounding. No peculiar mineralogical elements appear to be essential to the successful culture of this species, as M. Boulier observes that there is not the least sign of degeneracy in the fleeces of flocks grown upon calcareous or gypseous soils. The localization of this species in certain districts within the general domain assigned to it is quite remarkable, and appears to be mainly determined by the altitude of the country, the flocks of the pure race being rarely distributed upon the most elevated districts, in the deep valleys or the neighborhood of the forests. This localization is doubtless encouraged by the native proprietors, who unanimously assert that this goat cannot be transported from the place where it is born to a neighboring village without suffering a deterioration of fleece. Even the intelligent travellers above referred to seem to partake of this opinion. Direct observations, however, in Europe and elsewhere, have shown that this apparent deterioration is only the effect of age, and not due to a change of place and climate or food. The finest fleece is found upon animals a year old, which is worth eleven francs the kilogram; although somewhat less fine in the second year, it is quite good at the end of the fourth year, when it is worth six francs the kilogram. At the end of the sixth year the fleece is positively bad, and at this period the animals are usually killed, their natural life being only nine or ten years.

All authors agree that these animals, although able to resist both heat and cold except immediately after shearing, when they are liable to be destroyed by moderate depression of temperature, cannot withstand

much humidity, either in their pastures or folds. In a moist atmosphere they are especially subject to maladies of the respiratory organs, or a kind of pleuro-pneumonia. In severe winters, while the common goat of the country is unaffected, the mortality among the goats of the pure race is frightful. This is due largely to their confinement, when the temperature is 15° Centigrade, in very bad stables completely closed and unventilated, and to their nourishment upon fodder imperfectly dried, a very little barley only being given when the snow falls. The delicacy and lymphatic temperament of the white Angoras, which seem to be inherent to this race, appear to be closely related to their color. Some physiologists see in the color and delicacy of this animal the evidence of an imperfect albinism. In the very interesting discussions of the Board of Agriculture of Massachusetts in 1867 many curious facts were stated, illustrating the relation of a white color in animals with certain diseases and deficiencies; for instance, that white horses are subject to diseases to which black or red horses are not. Prof. Agassiz expressed the opinion that change of color in animals must be the result of some general change in the system, and if it is not shown in the eyes it will be shown in something else, the light color being a kind of bleaching of those darker tints which are connected with the qualities of the blood, indicating a certain feebleness of the system." These views are peculiarly interesting when taken in connection with the facts stated by M. Boulier as to the manner in which the losses above referred to are repaired. The fact had already been stated by M. Tchihatcheff, that when the losses are very considerable, the people of the country repair them by crossing the Angora with the common goats, and that the purity of the race is regained in the third generation. This statement was regarded in France as conclusive as to the expediency of crossing with the common goats of France, until the statements which follow were published. M. Boulier shows that the goats referred to as common in Asia are of the same species as those of the pure Angora race, from which they differ only in their color and size. The variety which is spread everywhere in Asia Minor, upon all soils and at all altitudes, is the black or Kurd race. The variety confined to the narrow limit is the *white* race. "The one and the other," he says, "have long fleeces. Their general forms resemble each other. The black goat is only of a size about a fifth larger than the white goat. The weight of the fleece of the black race varies between three and four oeques (3 kil. 750 to 5 kil.) The hair, black, straight, and without undulation, reaches a length of 0.27 m. * * * The length of the locks of the white race reach 0.25 m., and the weight of the best fleece two oeques (2 kil. 500.") M. Boulier cites two examples to show that the introduction of the white female goats into the country where they have not previously existed is not regarded by the natives as the most simple and rapid means of acquiring the more precious race. "Seventy years ago, at Zchiftela Gentchibe Yallaci, the natives possessed no white goats. Since that period they have crossed

the black female goats of the village with the buck of the white race, and at present there are not less than eight thousand goats of the latter race upon the territory of that district. We have examined the flocks, and the fleeces are in no respect inferior to any of those which we have seen elsewhere. It is now established in respect to these new generations that after three years of experience the newly crossed race has not degenerated; it is distinctly established, since for a long time the regenerators are taken from the flocks themselves. At Sidi Ghazi the crossing by the same procedure has been commenced within only six years. The flocks are magnificent." The effects of the crossing in the successive generations are thus detailed:

"1. The cross of a black female goat with a white buck will present a fleece marbled with a yellow color upon an impure white foundation. The flanks, the shoulders, and the head will preserve more particularly the marks of the color of the mother; the fineness of the fleece will be sensibly ameliorated.

"2. The cross of this first product with a white buck will cause all the dark tints to disappear. The fleece will become white. The shoulders and the flanks will be covered with wavy ringlets; but the whole line of the back and the forehead will remain furnished with coarse, straight hairs.

"3. On coupling this new cross always with a buck of the pure race we shall obtain a greater fineness in the long ringlets of the flanks and shoulders; the dorso-lumbar portion of the vertebral column will no longer retain coarse hairs, which will remain still on the upper part of the neck and forehead.

"4. A fourth cross, carried on with the same precautions as before, will fix a stamp of purity to the product; the coarse hairs will have disappeared on the forehead and neck.

"5. The consecutive crossings will render more stable the modifications already formed, and already after the fifth generation the individuals will be able to reproduce as if they were of the pure blood."[1]

An infallible proof of fineness not mentioned by M. Boulier is insisted upon by other writers, viz., the curling of the wool, which is observed upon the young individuals only when they are of the pure blood, so that all the young bucks are rejected from the flocks with the utmost care, as not being of the pure race, whose wool is not curled.

It is not to be denied that further observations are greatly to be desired in confirmation of the observations of M. Boulier. They are, however, referred to by M. Sace as both "skilful and conscientious,"

[1] Bull. supr. cit., t. v, p. 168. The facts stated by M. Boulier may seem inconsistent with the views elsewhere presented in this article as to the slowness of improvement by crossing. The identity of species in the black and white race is not settled by this naturalist. The power of deviation within wide limits may be a characteristic of this species in domestication; and these facts, to use the language of Professor Agassiz in relation to deviations of species, may "only point out the range of flexibility in types which in their essence are invariable." (A Journey in Brazil, p. 42.)

and are relied upon by the latter naturalist as establishing the identity of the species of the black Kurd and white Angora race, and they are quoted with approbation by M. Bemis, principal veterinary surgeon of the army of Africa. This identity seems confirmed by the observations of M. Diehl, who has personally visited Angora. "There is also a second or other variety of Angora or shawl-wool goat, besides those generally described. This goat has an unchanging outer cover of long coarse hair, between the roots of which comes in winter an under-coat of downy wool that is naturally thrown off in spring or is carefully combed out for use. A remarkably fine species of this breed exists throughout the area to which the white-haired goat is limited."

The number of goats of the white race grown in the district of Angora is estimated by M. Sacc and others at 300,000, and the product in wool (called tiftik by the natives, and mohair in England) at 2,000,000 pounds. The English tables of Turkish exports make the product in 1867 a little over 4,000,000 pounds. Formerly the wools of Angora were wholly spun or woven in place, and were exported in the form of yarns or camlets, of which the city of Angora sold, in 1844, 35,000 pieces to Europe. The exportation of the wool was prohibited, through the same wise policy which enabled England, by its monopoly of the combing wools, to build up its stupendous worsted manufacture. Some 1,200 looms were employed. The natives displayed great skill in making gloves, hosiery, and camlets for exportation, and summer robes of great beauty for the Turkish grandees.[1] The town flourished, and the whole population was busy and happy in the pursuit of their beautiful industry. After the Greek revolution the Turkish government was tempted by British influence to admit, free of duty, the products of European machinery, and to permit the export of the raw tiftik. This fatal step was the death-blow of the town of Angora. The whole product, with the exception of 20,000 pounds only, still worked up at home, was exported to England. The looms employed were reduced from 1,200 to not more than 50; and the town, although having at its command the raw material for a most important and characteristic manufacture, offers in its sad decline another monument of the desolating influence of that system which would make the raw material of every country tributary to the one great workshop of the world.

RESULTS OF EXPERIMENTS IN ACCLIMATION IN EUROPE AND THE UNITED STATES.

The attention of philanthropic agriculturists in Europe was drawn to this race in the last century. The first attempt to appropriate the race in Europe was made by the Spanish government, which imported a flock in 1765, which has disappeared. Next followed the importation of the President Tour d'Aigues, who introduced some hundred upon the Low Alps in 1787. This experiment of acclimation appears to have been

[1] Southey on Colonial Wools.

wholly successful, as this eminent agriculturist declares that although his flocks received no special care, they were constantly preserved in good health, and accommodated themselves as well to the climate as to the pasturage. "I can attest," he says, "that nothing is easier than to raise and nourish the species; they are led to the pastures with the sheep, and are fed like them in winter." Towards the end of the last century Louis XVI imported a flock of Angoras to Rambouillet; but this, as well as the flocks of Tour d'Aignes, disappeared in consequence of the revolution. The best results were obtained in Spain from the importation of a flock of 100 in 1830 by the King of Spain. M. Graells reports that this flock was transported to the mountains of the Escurial, where, he says, "I had occasion to see them for the first time in 1848, that is to say, 18 years after their entry into Castile. At this time the flock was composed of 200 individuals, almost all white. The males had a magnificent fleece. The shepherds told me that all the primitive individuals had disappeared, and that those which lived were born in the country, and that they could be regarded as naturalized to the climate, the food, and other inherent conditions of the central region of Spain. At Huelva there is another flock of Angora goats, composed of 100 head, and from the information I have obtained it prospers very well in the mountainous region of that province."[1] The above extract is instructive, as showing the slowness with which this race is multiplied, the primitive flock having tripled only in 18 years.

In 1854, the Imperial Society of Acclimation of France resolved upon vigorous efforts to appropriate this race. In 1855 it was in possession of a flock of 92 head. This flock was subdivided and placed in different districts in France. But the success was far from encouraging. Many died, and those which survived gave fleeces which were far from satisfactory. In 1858, all the separate flocks were reunited and placed at Souliard in the mountainous and trachytic district of the Cantal. The animals rapidly recovered their health, and were increased without suffering any malady. The fleeces were in an admirable condition, and were fabricated into velvets of such fineness and lustre that it was pronounced that "the wool of the Angora goat has been ameliorated in France." The increase of this flock was disastrously checked by the rigorous winter of 1859, and the rainy and damp summer which succeeded. "The abundant snows of the winter," says M. Richard, "prevented on the one hand the goats from issuing from their stable; the stabulation favored in them a predominance of the lymphatic system. On the other hand the showers and the incessant rains of the spring continued during the whole summer. The goats, always in a damp atmosphere, eating wet grass, contracted as well as the sheep an aqueous cachexy; a third of the animals succumbed from this malady. If energetic means had not been employed upon the first symptom of the invasion of the affection which was decimating the flock, it is very prob-

[1] Rapport de M. Ramen de la Sagra. Bull. supr. cit., t. i, p. 23.

able that few would have survived. The malady was arrested by a tonic and fortifying medication." The flock, reduced from 92 head in 1855 to 70 in 1862, was at the latter period in good health.[1]

The experience in France, although by no means encouraging in all respects, is instructive as indicating the principal cause of the destruction of the flocks, exposure to a damp climate. The excessive climate of the middle and northern districts of this country, the cold winters and warm dry summers, would seem to indicate these districts as most favorable to the acclimation of this species. Experience has fully confirmed what might have been assumed *a priori*. The first importation was made in 1849, by Dr. J. B. Davis, of eight Angora goats, two bucks and six females. The facts relative to subsequent importations and their results are given in the elaborate article of Mr. Diehl, which, being readily accessible in the widely circulated Agricultural Report of 1863, I need only briefly refer to. Mr. Diehl gives the results of his observation of most of the flocks, proceeding from some 300 head imported from Angora, numbering, according to him, several thousand, and scattered mainly through the southwestern States, as follows:

"We have either personally visited and examined most of the localities and flocks (mentioned by him,) seen or obtained animals or specimens of the wool, comparing them with what we saw abroad and the best specimens of wool to be obtained from abroad, or the best imported ones, and are well satisfied and thoroughly convinced that we have succeeded, and can continue to succeed, in raising this valuable wool-bearing animal, with its precious fleece, almost anywhere throughout our country where sheep will prosper, especially in the higher and colder localities, producing an animal more hardy, with a heavy and more valuable fleece than the Angora or Cashmere itself in its own country. The specimens of wool in our possession are more silky and fleecy than the imported or original ones." M. Diehl gives extracts from original communications of practical stock raisers confirmatory of his statements. It is to be regretted that the value of these observations is diminished by the want of accurate discrimination between the products of the crosses and animals of pure blood.[2]

[1] Sur les animaux de la Société d'Acclimation, par M. Richard (du Cantal,) t. ix, p. 5.

[2] Of the recent importations of Angoras into this country the most considerable have been made by M. Winthrop W. Chenery, of Belmont, Massachusetts, (office 196 State street, Boston,) who has made arrangements for this purpose with a commercial house having a branch in Constantinople and a confidential agent in the district of Angora. Mr. Chenery, who is an experienced stock breeder, has imported about 300 animals of this race, and has at present 80 or 90 imported animals upon his farm at Belmont, which are for sale. The first Angoras sent to California were imported by Mr. Chenery, 26 full-blooded animals having been introduced by him into that State. The experience of Mr. Chenery and the excellent condition of his flock, which I have visited, are conclusive as to the successful acclimation of this race in this country. The first animals under his charge were placed upon his farm by an agent of Dr. Peters, of Georgia, at the breaking out of the rebellion. These animals having been sheared under the direction of the agents of Dr. Peters, were immediately exposed to cold easterly winds, and several became affected by a pulmonary disease and died.

APPLICATION OF PRODUCTS.

It has been already stated that mohair is not a substitute for wool, but that it occupies its own place in the textile fabrics. It has the aspect, feel and lustre of silk without its suppleness. It differs materially from wool in the want of the felting quality, so that the stuffs made of it have the fibres distinctly separated and are always brilliant. They do not retain the dust or spots, and are thus particularly valuable for furniture goods. The fibre is dyed with great facility and is the only textile fibre which takes equally the dyes destined for all tissues. On account of the stiffness of the fibre it is rarely woven alone; that is, when used for the filling, the warp is usually of cotton, silk, or wool, and the reverse. It is not desired for its softness in addition to silkiness, such qualities as are found in Cashmere and Manchamp wool, but for the elasticity, lustre, and durability of the fibre, with sufficient fineness to enable it to be spun. Those who remember the fashions of 30 or 40 years ago may call to mind the *camlets* so extensively used for cloaks and other outer garments, and will doubtless remember that some were distinguished for their peculiar lustre and durability, which was generally attributed to the presence of silk in the tissue. These camlets were woven from mohair. Its lustre and durability peculiarly fit this material for the manufacture of braids, buttons, and bindings, which greatly outwear those of silk and wool. The qualities of lustre and elasticity particularly fit this material for its chief use, the manufacture of Utrecht velvets, commonly called furniture plush, the finest qualities of which are composed principally of mohair, the pile being formed of mohair warps, which are cut in the same manner as silk warps in velvets. Upon passing the finger lightly over the surface of the best mohair plushes, the rigidity and elasticity of the fibre will be distinctly perceived. The fibre springs back to its original uprightness when any pressure is removed. The best mohair plushes are almost indestructible. They have been in constant use on certain railroad cars

Mr. Chenery by proper precautions has since preserved his flock in perfect health. A warm but ventilated shelter is provided, to which the animals have access summer and winter. In a flock of nearly a hundred, not one has died for a year. Mr. Chenery regards these goats as more hardy than sheep. They are fed in the same manner as sheep, with the exception that white-pine boughs are occasionally given them to browse upon during the winter. They delight in rocky and bushy pastures, feeding eagerly upon barberry and raspberry bushes. They cannot be confined by ordinary stone walls, but are restrained by any fence which they cannot climb, as they do not jump. They are herded and driven more easily than sheep. The doe never produces more than one kid at a birth. The young demand attention when they are first dropped, as they are liable to chill. After they have once suckled there is no further trouble. Although quite small at birth, they grow with great rapidity. The average product of fleece is, for bucks, seven, eight, and sometimes as high as 12 pounds. The does produce from three to five pounds. Mr. Chenery states in illustration of the hardiness of this race, that seven animals sent round Cape Horn were six months upon the voyage, and all arrived at their destination in good health. It is stated that if there should be a sufficient demand for these animals there would be no difficulty in increasing the importations to some thousands per year.

in the country for over 20 years without wearing out. They are now sought by all the best railroads in the country as the most enduring of all coverings, an unconscious tribute to the remarkable qualities of this fibre. The manufacture of Utrecht velvets at Amiens in France consumes 500,000 pounds of mohair, which is spun in England. Ten thousand workmen were employed in weaving these goods at Amiens in 1855, the product being principally sent to the United States. The mohair plushes are made of yarns from No. 26 to No. 70; the tissues made of the former number are worth four francs per metre, and of the latter 10 francs per metre, showing the importance of preserving the fineness of the fleece. A medium article is made extensively in Prussia, of yarns spun from an admixture of mohair with combing-wool, but it is wanting in the evenness of surface and brilliant reflections or bloom of the French goods. Mohair yarn is employed largely in Paris, Nismes, Lyons, and Germany, for the manufacture of laces, which are substituted for the silk lace fabrics of Valenciennes and Chantilly. The shawls frequently spoken of as made of Angora wool are of a lace texture, and do not correspond to the cashmere or Indian shawls. The shawls known as llama shawls are made of mohair. I have seen one at Stewart's wholesale establishment valued at $80, weighing only 2½ ounces. Mohair is also largely consumed at Bradford, in England, in the fabrication of light summer dress goods. They are woven with warps of silk and cotton, principally the latter, and the development of this manufacture is due principally to the improvements in making fine cotton warps, the combination of wool with mohair not being found advantageous. These goods are distinguished by their lustre and by the rigidity of the fabric. All the mohair yarns used in Europe are spun in England, the English having broken down by temporary reduction of prices all attempts at spinning in France. Successful experiments at spinning and weaving Angora fabrics have been made in this country, as shown by the samples of yarn spun by Mr. Cameron, and the dress goods spun and woven by Mr. Fay of the Lowell Manufacturing Company, from Angora wool grown by Mr. Chenery, of Belmont.

Before the demand of this material for dress goods and plushes, mohair was largely used in Europe and this country for lastings for fine broadcloths, the lustrous surface acting as a frame in a picture to set off the goods. This use is now abandoned. Mohair is now extensively used to form the pile of certain styles of plushes used for ladies' cloakings, also for the pile of the best fabrics styled Astrakhans. Narrow strips of the skin of the Angora with the fleece attached have been recently in fashion for trimmings, and great prices were obtained for a limited number of the pelts for this purpose. The skins with the fleeces attached will always bring high prices for foot rugs, on account of their peculiar lustre and the advantages they possess over those made of wool, in not being liable to felt.

Nearly all the raw mohair of commerce is at present consumed by a very few manufacturers in England, who first commenced spinning in

1835, at the suggestion of Mr. Southey, and soon excluded the Turkish yarns by the superiority and evenness of their yarns. The enormous works of Mr. Salt, in England, were erected in 1853, mainly for the manufacture of mohair and alpaca fabrics.[1] The annual exports of mohair from Turkey as well as other instructive facts are given in the following letter, addressed to Messrs. G. W. Bond & Co., December, 1867, by Bauendahl & Co., a leading wool and commercial firm in New York, obtained at my request:

"Agreeably with the request of your Mr. G. W. Bond, we beg herewith to hand you all the information we have regarding mohair or goats' wool.

"Good mohair (Angora goat) is not known as an article of commerce anywhere but in Asia Minor. It is received from Asia Minor in bales varying from 150 to 200 pounds in weight, as most convenient, each fleece carefully rolled up and tightly packed. The exports from Turkey are as follows:

Years.	Bales.	Years.	Bales.	Years.	Bales.	Years.	Bales.
1850	12,884	1861	16,592	1863	14,812	1865	27,641
1860	11,9.2	1862	17,706	1864	19,761	1866	22,068

"We have seen samples of goats' wool grown in South Africa and this country, but they had degenerated, becoming coarser and losing the lustre and silky appearance which gives the staple most of its value. It is consumed by less than a dozen houses in Europe; in fact, one firm consumes about one-third of the whole supply, and has agents in Turkey choosing the same. It is a very peculiar article; either everybody wants it, or no one will touch it. There seems to be no steadiness in the trade; but the demand is seldom in abeyance for more than four months at a time. Large buyers have avoided it for some time; therefore stocks have accumulated to a considerable but not excessive extent.

"About two years ago the price was up to nearly 96 cents gold, and fell, after long inaction, to about 50 to 54 cents gold per pound for super white Constantinople; but even at this price there is very little demand. The value of second-class locky lots is always very uncertain. It forms, however, only a trifling portion of the exports, and will fetch about 20 to 30 cents gold per pound.

"Fawn, a dark gray mohair with long staple, is usually salable at 24 cents gold to 30 cents currency. There is also a fair kind of brown mohair, but shorter and more cotted, that we think sells best in France at prices between 20 to 30 cents gold. The terms on which this article is sold in the market are cash in one month, less five per centum discount; England, tares actual, and one pound draft, per cwt."[2]

[1] Vide Jame's History of the Worsted Manufactures.

[2] Since this paper was written Messrs. Bauendahl & Co., have furnished important information in a letter dated September 17, 1868, and published in the *Country Gentleman*.

I have ascertained from other sources that the price of mohair in England of late years has been about double that of the best English combing wools.

RECAPITULATION AND CONCLUSION.

Experience in Europe, confirmed by observations in this country, has demonstrated the practicability of the acclimation of this race under favorable conditions of the climate, without degeneracy of the fleeces. There are districts in this country possessing climate, temperature, and hygrometric conditions corresponding to those observed in Asia Minor and Europe as favorable to the culture of this race. The Angora goat and the domestic goat of Europe and this country, having descended from separate sources, the obtaining of good results from the crosses of these two races is theoretically improbable, and is demonstrated to be so by the best experience in Europe. The normal fibre desired for the textile arts is only to be found in flocks of the perfectly pure race, and perhaps in flocks bred back to the standard of the pure race by crosses of a perfectly pure buck with the black Asiatic goats of the same race.

They say: "The recent remarkable increase in the consumption of goat wool in Europe has induced us to bring the subject under the notice of American wool-growers Manufacturers here would use mohair largely if they could depend upon a regular supply, and, as we have the fact now established that, with sufficient care, goat's wool can be raised of a superior quality here, we think that the time has arrived when every possible effort should be made by our wool-growers to supply the want. The trade offers a most extensive field and prospects of ample profits.

"Mohair, as an article of commerce, is at present not grown anywhere but in Asia Minor, and the entire exports to England last year amount to 2,200,000 pounds. This is quite inadequate to accommodate the present demand, and the necessity of a larger supply becomes daily more and more manifest. We have seen samples of mohair grown in South Africa, but they had degenerated, becoming coarser and losing the lustre and silky appearance which give the staple most of its value.

"We hear that last month large sales were made in England at about 80 cents, gold, per pound, and at this price consumers continue to buy freely when good staple and condition are assured. The stability of this price, however, is uncertain, and the value is dependent on the demand of the fancy trade, though this article has gained greatly in steadiness by its being employed in many new fabrics for upholstering purposes, laces, dress goods, &c.

* * * * * * * *

"This article we receive for sale on consignment, and our last lots realized from $1 to $1 25 (currency) per pound, just according to quality and condition. The latter price has been likewise paid for a small lot forwarded to us by a breeder near Frankfort, Ky., who is also interested in raising *full-blood* goats. We find it exceedingly difficult to place second-class lots; in fact, such are hardly salable, and their value is very uncertain. The great fault of goat's wool is the abundance of scurf and kemps, (dead hairs,) and the greatest attention should be directed towards avoiding these evils.

"In Europe mohair is consumed by less than a dozen houses; in fact, one firm consumes about one-third of the whole supply. It is important to have the mohair well and regularly packed in good sacks, weighing about 250 or 300 pounds, as most convenient for the trade."

It will be observed that the practical observations of these experienced wool buyers confirm the views presented in the above paper as the worthlessness of the fleeces of crossed goats. I have examined several pelts from South Africa, evidently from crosses of the Angora and common goat, in which the fine wool from the Angora was so mixed with coarse hairs of the common stock as to render the fleeces useless for textile purposes.

It is desirable that importations should be made of the black female Kurd goat of Asia Minor, for crossing with the pure white bucks. There is evidence of great weight in favor of good results from such cases.

Systematic measures of acclimation must always be impeded by the eagerness of breeders for sale to obtain merchantable results. The appropriation of this race is of sufficient importance to deserve the earnest attention of the government, as the best races of the merino sheep have been only secured through the persevering and disinterested efforts of governments in Europe. In the absence of any national society for acclimation in this country, a deficiency which ought not long to exist, the Department of Agriculture, under its present vigorous and intelligent head, offers the best means of securing the desired results. The cost of a single Rodman gun would secure a magnificent flock to serve for prolonged experiment and as a model to our agriculturists. Producers cannot expect to obtain remunerating prices for their fleeces until the manufacture of mohair fabrics is established in this country. It must be years before a sufficient supply is grown here to occupy a single mill. The fleeces of over 10,000 sheep are consumed every week in the single establishment of the Pacific Mills. It is probable that there will be a demand for all that can be grown for some time, for yarns for braids, and for Astrakhan cloakings, which are being made in Rhode Island. The demand for animals of the pure race will increase without reference to the value of the fleeces. There are enough agriculturists of taste and wealth in this country who will readily pay large prices for these docile and beautiful animals, simply as ornaments for their farms.

I am convinced that the greatest obstacle to the permanent acquisition of new resources from any department of nature is exaggerated expectations as to their value and facility of acquirement. Our impatient countrymen need to be reminded that real progress is the offspring not only of human effort but of time, and that of acclimation especially it may be said: *Non solum humani ingenii sed temporis quoque filia est.* There is encouragement, however, in the fact that the fruits of decades or centuries in older countries are matured here in years. In how brief a time has this vast country been stocked with all the animal wealth which Europe had to bestow! How rapidly have we appropriated all the best ovine and bovine races of the old world! Within half a century we have spread the merino sheep over all the prairies of the West, and within a less period have acquired and perfected the cattle of the Durham short-horn breed, and even sent them back to ameliorate the parent stock in England. The hope then is not vain that the precious race, whose slow march westward we have traced from the remote East, may at no distant time be fully secured for the western world.

APPENDIX C.

THE WOOL BEST ADAPTED TO VARIOUS MANUFACTURES.

Extract from the proceedings of the convention of delegates from the National Association of Wool Manufacturers, and from the several organizations of the wool-growers of the United States, at Syracuse, New York, December 13, 1865.

The fourth subject for discussion was then taken up, to wit, the wool best adapted to the various manufactures, especially that of worsted.

The PRESIDENT. We should be glad to know what you do with our wools; what kind of wools go into what kind of fabrics. We should be glad of some practical information upon that subject.

Mr. HAZARD. The president of our association (Hon. E. B. Bigelow) has paid more attention to this subject, perhaps, than any other person, and I hope we shall hear from him upon it.

Mr. BLANCHARD. If the inquiry is with reference to worsted wools particularly, I think our secretary has some facts in regard to it that will be of interest to the wool-growers here. But, sir, in connection with that, if I may be indulged with the attention of the assembly for a few moments, I would like to express briefly some views of the different kinds of sheep, which, in the estimation of manufacturers, it would be desirable to raise in this country.

There are diversified interests among the manufacturers. There is a great diversity of talent among them. One man, possessing a taste, a cultivated taste, if you please, for fancy articles, will enter upon the manufacture of those fabrics that are styled fancy goods, and succeed in them admirably, and to the entire satisfaction of himself, as well as benefit to the community. Another man, attempting to produce the same article, would fail in business in less than six months. I know some men who have spent almost a lifetime in making black doeskins, until they have attained a perfection in the article that is almost unsurpassed by the Germans. Let those same men attempt to manufacture a cheap article, and the probability is that they would fail to accomplish their object.

Now, I have thought that perhaps the same principle might apply to wool-growers. In my experience with the wool-growers of the country, I have sometimes found a man who would take a Saxony flock of imported sheep, retain all their excellence, and continue to improve on that flock, until he had secured perhaps one of the best in the United States. I have now in my mind one man in Washington county, of whom you may have heard, I mean Mr. Samuel Patterson, whose flock was, if not superior, at least fully equal, to any other in the State of Pennsylvania. He had a taste for it; and by his knowledge of the habits of Saxony sheep

he was enabled to cultivate them, and to cultivate them with success. Other men prefer to cultivate the merino sheep; and, in the application of their minds to that branch of sheep culture, they have been eminently successful. Another class of men, living near large cities, who may go into Canada, or into some of the sections of the country where a large kind of sheep are grown, purchase their stock, take them to the vicinity of the large cities, put them upon their pastures, feed them until they become fat, and then take them to market and sell them for mutton; such men, though the wool that is upon these sheep is coarse wool, are successful in that branch of sheep husbandry. Hence, it seems that we need this diversified application of the talent of the country in the production of the raw material, as much as we need the diversified talent that exists among manufacturers in producing the various articles we want.

Now, if this is so—I make these remarks to throw the thought before the minds of the wool-growers—is it wise to abandon the growth of Saxony wool? If I mistake not the public sentiment of the wool-growing community at the present time, it is that the grade of wool which is usually denominated merino is fine enough to meet the wants of all the manufacturers of this country. Let me assure you that it is not so. Unless you do produce the Saxony wool, we, as manufacturers, will be forced to resort to foreign markets for a supply. There are certain fabries manufactured to-day that cannot be made without that grade of wool which is denominated Saxony wool, fine wool, finer than any other that is produced in this country, (I use the words as they are practically used among farmers, without specifying the difference that exists between them.) If you wish to-day to make a very fine broadcloth—and if the object we have in view is carried out, that the manufacturers of this country are to supply the wants of the country—you must have clean, fine wools to do it; such wools as the Australian, Cape of Good Hope, or German wools. If you don't, you cannot make the article.

I will give you an instance, to show the difficulty of getting this fine wool, which illustrates the point I have in view. I am engaged in the manufacture of ladies' shawls. The consumption of our mill, for the year, is about 350,000 pounds. In the last six months, I directed the sorters, if they found what we term a "pick-lock" fleece, to lay it aside. During these six months they have only saved about 400 pounds of that quality. The next grade we use is what is ordinarily denominated the fine wool of this country. From that we have made an article, which, when taken to New York, was sold to a prominent importer at an advance of 33⅓ per cent. over any article of the kind ever made in this country, I believe, except, it may be, something that was made for exhibition at a fair.

I only allude to this to show that that kind of wool must be produced in this country if we intend to supply the demand of this country for fine fabrics. If that be so, is it wise on the part of the wool-growers of this country to abandon the raising of fine wools? I know you may turn on

me, and say, "You won't pay us for it;" but I say we will pay you for it, if you will sell it as cheap as we can get it from the foreign grower, and not without. That is plain common sense: I say we can pay you for it; and I say that, if properly classified and properly presented to the manufacturer, you can get your price for it. But you can't take your Saxony wool to the manufacturer of fancy cassimeres, who wants a medium grade of merino wool, and expect that he will pay you as much for it as the manufacturer of fine broadcloths, fine doeskins, and fine shawls. Unless you can present that wool to the manufacturer who wants to use it, you can never get its value. If it is sold to the passing buyer, who is travelling round the country, he will give perhaps a cent and a half a pound more for it than for ordinary wools.

I simply call your attention to this matter that you may think upon it and act upon it as your judgment may dictate. I now renew my call upon our secretary for facts in his possession in relation to worsted wool.

Mr. JOHN L. HAYES, of Massachusetts. I will respond with pleasure to the request of the gentleman from Connecticut, and submit to the convention some considerations bearing upon the importance of increasing the production of combing or worsted wools in this country; but, before addressing myself to that special subject of inquiry, I desire to call attention to some facts which will throw light upon the extent to which wool in general is used in the textile arts, and which will illustrate the demand in the markets of the world for this material, and the tendency of the age towards its increased consumption. There is no more interesting or practical question, to the producer of wool especially, than the inquiry whether there is a demand for his product, and whether there will be such an increased demand as will continue prices, and justify him in expending capital for increased production.

In pursuing this inquiry, we are struck with the observation that nature is economical in the supply of the raw material, or rather in the varieties of raw material, which are to be worked up by man. How few are the great natural staples which make up the bulk of commercial commodities. But the uses of any raw material, which is found applicable in the arts, are infinite. We utterly fail to imagine the new applications to which such raw material may be made. Every improvement in the arts, in chemistry or machinery, each new step in the progress of civilization or luxury, increases the modes of application and consequently the demand. The demand for a particular fabric or manufacture may cease through change of fashion, but the demand for the raw material never.

The demand for wool received its most important impulse in modern times at about the commencement of the present century, or perhaps the latter part of the last century, from the great improvements which were made in cotton machinery, which were applied also to wool. The improvements in the spinning jenny, the introduction of the power-loom, and the establishment of the factory system, multiplied the power of the

manufacturer to such an extent, that an unprecedented demand for wool began to arise. Then the increased use of other kindred fibres added also to the consumption of wool. It is a curious fact, that cotton, although it has always been regarded as the rival of wool, has added largely to its consumption. It is stated by English observers, that the use of cotton warps has added vastly to the extent to which wool is used in England. Entire factories are now engaged in the manufacture of cotton warp; and it is found that, by the use of this warp with woollen filling, cotton, instead of being a competitor, is the most important auxiliary of wool.

I will now refer to the statistics which illustrate the progress of the demand for this material. The increase in the consumption of wool is strikingly shown by a comparison of two periods in England, no further apart than 30 years. The importations of wool into England 30 years ago were—from Germany, in round numbers, 74,000 bales; from Spain and Portugal, 10,000 bales; the British colonies, 8,000 bales; sundry other places, 5,000 bales. Total in 1830, 98,000.

Now compare these imports with those of 1862 and 1864. In 1862, the imports from Australia were 226,000 bales; from the Cape of Good Hope, 66,000 bales; from Germany, 29,000 bales; from Spain, 1,000 bales; from Portugal, 11,000 bales; from Russia, 40,000 bales; from the East Indies, 52,000 bales; from South America, 80,000 bales; sundry other places, 96,000 bales. Total, 585,000 bales. Then we come to 1864, and we find from Australia, as against 226,000 in 1862, 302,000 bales; as against 66,000 from the Cape of Good Hope in 1865, 68,000; as against 80,000 from South America in 1862, 99,000. In all, in 1864, 688,336 bales.

Comparing that with the importation only 30 years before, we have 688,000 bales as against 98,000. Australia now supplies more than three times the whole amount of foreign wool consumed in England a third of a century ago. The production of South America exceeds the whole consumption then. In this short period, the consumption has actually increased seven-fold. The production of wool in England is 250,000,000 pounds; the imports, 184,000,000; the exports, 54,000,000; so that the total amount consumed in England is 380,000,000 pounds. Add to that the shoddy, of which 65,000,000 pounds are consumed, and we have the enormous total of 445,000,000 pounds of wool consumed in England alone.

Now this increase of production and consumption is not confined to England alone; it goes on in the same ratio in other countries. In 1861, France exported woollen goods of the value of 188,000,000 francs; in 1863, 283,000,000 francs. The production of Germany, Russia, and Austria is increasing in the same ratio; so that we have now, it is estimated, a consumption in all the world of 1,600,000,000 pounds of wool, and yet hundreds of millions of people, as in China, are just beginning to appreciate the value of woollen fabrics. Even France has but just commenced to supply herself with carpets.

The testimony taken before the House of Lords in 1828 shows that, although less than 98,000 bales of wool were brought into England at that time, every warehouse was filled with wool, and stocks were lying on hand sometimes for five or six years; whereas, at the present time, as I am informed by an English gentleman of great intelligence, and a very large dealer in wool, Mr. Bowes, the warehouses are exhausted, and there are no stocks on hand. The demand is fully up to the supply.

The facts in relation to prices are not less interesting. In 1855, the price of English combing-fleeces was *1s. 1½d.* In 1864, the price of the same wools was *2s. 4d.* Australian fleeces averaged in 1855 *1s. 8d.*, in 1864, *1s. 10d.* Cape fleeces in 1855, *1s. 5d.*; in 1864, *1s. 4d.* Buenos Ayres, fair mestizo, in 1855, *7d.*; in 1864, *8d.* Cordova, in 1855, *8¾d.*; in 1864, *11½d.*

Thus we see that the fine wools have not declined; they have kept about the same ratio.

But the question still remains, Will the demand for the fine wools, relatively to other kinds, continue? In considering that question, it is worth while to look at the production of Australia particularly, and the facts which show the extraordinary increase in the ratio of production in the Australian colonies. In 1797 three merino rams and five ewes were carried there; but so slow was the introduction of the production of wool into those colonies, that it was not till 1807, 10 years later, that the first bale of wool was carried from Australia to England. But the flocks of Australia did not originate from that source. The development of fine wool husbandry in these colonies was the result of an accident. Some English whalers captured in the South Seas, about the beginning of the present century, a vessel proceeding to Peru from Spain, in which there were 300 merino rams and ewes. These sheep were carried to Australia, and originated the fine merino wool, whose production is now estimated at 100,000,000 pounds; and are sold in special market at London, to which all the manufacturers of the world resort. The production of fine wool of La Plata is estimated at 100,000,000 pounds; and that of the Cape at 50,000,000 pounds. And when you remember that only a portion of Australia has been developed, and that the vast and fertile interior still remains to be opened up, who can tell what shall be the production in the future? The pampas of the Argentine Republic offer even a more unbounded field for production. They present a vast uplifted alluvial plain, 800,000 square miles in extent, presenting an ocean of verdure, where wool-growing in the production of fine wool called mestiza, or improved wool, is pursued with more vigor and profit than in any other part of the world, with the single drawback that the value of the wool is greatly impaired by burrs derived from a species of clover peculiar to the vegetation of the pampas. In view of the fields for the production of fine wool, thus rapidly expanding, which are opened abroad, it is well to inquire whether it may not be desirable to turn our attention to some other of the various kinds of wool in which the competition of foreign countries is not likely to be so formidable.

In considering this matter, the producer of wool should not overlook the competition with clothing or merino wool of a material which was not known in manufactures until the present century. I refer to shoddy, or rather that variety of shoddy known in England by the name of mungo. The term "shoddy," strictly speaking, is the name applied to fibre made from soft rags, from flannels and blankets which were first used in manufacture of cloth. The use of this material originated at Bately, in England, in 1813. Mungo is the fibre obtained from hard rags of fine broadcloth, such as clippings from the tailors' shops. This was not introduced until later, and the manufacturers of Bately were quite incredulous of its being utilized. The Yorkshire man, who first conceived the idea of using the fibre of hard rags, obstinately replied to the objection that the material could not be introduced, "It mun go," (it must go.) It did go, and a new substance was introduced into the arts, and a new word into the English language. Of shoddy and mungo 65,000,000 pounds are consumed in England, more than our whole clip of wool in 1860. It is estimated that 25,000 persons are employed in converting shoddy into cloth, and that the value of the product is five or six million pounds sterling. The fact, however, to which I wish to call attention is, that shoddy comes in competition with fine or cloth wool only. It is not used in the manufacture of worsted, and does not take the place of combing-wools.

When we look at the facts as to prices before given, we find that the English combing-fleeces were worth in 1855 only 1*s.* 1½*d.*; in 1864 they were worth 2*s.* 4*d.*; that is, they had more than doubled in 10 years, while cloth-wools had just about held their own in respect to price. England is the only country which has devoted itself exclusively to the production of the long combing-wools required for the manufacture of worsted. She cannot, or does not, produce any fine wool. There are, in fact, no merino sheep in England. It is believed, however, that England has attained to the utmost production of this wool of which her limited territory is capable. The manufacturers of Bradford are already alarmed, and have issued circulars to induce a greater supply of lustre wools. England is the only country which now produces, to any extent, the long combing-wools. It is found that in Australia the combing-wools cannot be grown; and they cannot be grown at the Cape. I have the authority of Mr. Bowes for saying that the experiment has been fully tried, and has signally failed; that Leicester, Cotswold, and Lincolnshire sheep have been repeatedly carried to Australia and the Cape, and every effort made to introduce the culture of long-woolled sheep; but it has been found that after a little while the wool is converted into hair, and it is now admitted that the long combing-wools cannot be grown in Australia or at the Cape. But the combing-wools *can* be grown in the United States. The fact of the fitness of this country for the growth of combing-wools is completely established by the success which has attained the production of that kind of wool in Canada. The amount of comb-

ing-wools now produced in Canada is between five and six million pounds. The quality, in the English market, is not regarded as by any means equal to their own combing-wools, because the same care is not taken in its production, and the English complain that the wool is full of burrs. In England the most extraordinary care is taken. The fields are actually swept, that the fleeces may receive no injury from dirt. But our worsted manufacturers have found the Canada wools perfectly good substitutes for the English wools, and have paid as high as $1 40 currency for wool worth five years ago only 28 cents. The attempt has been made in this country to manufacture alpaca goods from this long combing-wool, for which, by reason of its lustre, it is peculiarly fitted. There was some failure in the first experiment, and the manufacturers supposed that the wool was not suitable. They then sent to England, and imported 1,000 pounds of the best combing-wool; and, upon a comparison of that with the combing-wool of Canada, it was found that the Canadian wool was equal to the English in every respect. I have here some specimens of this fabric, which is called "alpaca" because it is an imitation of the fabrics made from alpaca wool. (The speaker held up the specimens to the view of the convention.) This stuff is made of a filling of the long combing-wool of Canada with a warp of cotton. The fabric is equal in finish and lustre to any imported from England.

The question is eminently worthy of the consideration of our farmers, whether the long-wool husbandry may not be profitably introduced into this country. This is a question upon which we, as manufacturers, pretend to give no opinion. We can only assure the farmers of the United States, that there is a growing demand for this material, that there will be less competition in the growth of this wool than in any other, and that the prices are certain to be higher than for any wool which can be grown in this country. To determine the question of profit, it will be necessary that experiments upon an extensive scale be tried, and will be doubtless necessary that a system of husbandry should be developed in this country analogous to the four-field system in England, but fitted for the peculiar necessities of our soil and climate. I can conceive of no subject more worthy of the attention of the National Association of Wool-Growers, formed here to-day, or of the boards of agricultural colleges in the several States.

It may be said that the introduction of long-wool husbandry will interfere with that already established in this country. I see no force in this objection. It is probable that this kind of sheep husbandry can be profitably carried on only in those districts where there is a demand for mutton, and where the mutton will be as much an object as the wool. It seems to me, Mr. President and gentlemen, that the development of this species of sheep will not interfere with the branches of sheep husbandry which are now pursued, but will give an increased demand for the peculiar kind of merino wool now being produced by the intelligent skill of the Vermont breeders. Dr. Loring this morning quoted some remarks

of mine in reference to the peculiar value of the American merino fleece. I am convinced that the fabrics to which the coarse merino wool that seems to be in favor here is best adapted, have not yet been manufactured in this country to any extent. The class of goods to which that wool is peculiarly fitted are the fabrics somewhat analogous to the goods called "coburgs" and the goods called "merinoes" and "thibets," the soft stuff goods for women's wear. Now, in that branch of manufacture, or that of stuff goods as distinguished from cloth goods, France employs 300,000 persons. In this country, there were not 5,000 employed in 1860. The remarkable development of that branch of industry in France is attributed to the peculiar qualities of the merino wool which the French possess. This wool is long in staple, the sheep are of unusual size, and the fleeces heavy, having, in fact, the very characteristics of the American merino. M. Benoville, a very eminent manufacturer and a practical man, who has written a work on the combing-wool industry of that country—one of the most learned works that has ever been written upon any branch of the practical arts—describes these fabrics in detail, and gives the reasons why France has obtained such eminence in their production. The most important reason which he gives is in these words:

"The first fact that we ought to proclaim abroad is, that without the introduction of the Spanish race into our flocks, and without all the skill of our agriculturists, we should still vegetate in dependence upon neighboring nations, and should be reduced to clothe ourselves with their stuffs. It is to the admirable revolution in the raising of ovine animals that we owe the beautiful industry of spinning the merino combing-wools. It is to this that we owe the splendor of the industries of weaving combing-wool at Paris, at Rheims, at Roubaix, at Amiens, and St. Quentin."

Now, I wish to enforce this position. In order that the worsted manufacture should be developed in this country—and by the worsted manufacture I mean the manufacture of stuff goods in their infinite variety for female apparel and furniture trimmings, &c., as distinguished from cloth goods—there must first be a supply of long combing-wool from sheep of the English breed. The development of the manufacture created by the supply of these wools will be the most certain means of creating the demand for the long merino wools for soft stuff goods, for which I have shown they are peculiarly fitted. We are as yet but in our infancy in our manufactures. The work before us, as wool-growers and manufacturers, is to clothe all the people of the United States with our wool and our fabrics. We have but just commenced the work; and when a full supply of raw material is furnished, and grower and manufacturer are encouraged by a stable system of protection, the imagination can hardly conceive the grand field which will be opened in this country in the industry of wool and woollens.

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Mr. GEORGE W. BOND, of Massachusetts. In my position as chairman of the committee on raw materials, I have given some attention to

this subject. Our annual import of worsted goods from Great Britain is about fifty million yards, besides a very large amount, of which we have no accurate record, from France. Those from France are principally of a character for which our long merino wools are admirably well adapted. We need to make all the varieties of goods that we consume in this country, of all the varieties of wool that we produce. Had I known, before I left home, that this question was to come up in this form, I could have prepared myself with an approximate statement of the quantity required of the different kinds of wool. In round numbers, we require some fifteen million pounds of wool, in the state in which it generally comes to market. A little of the grade of wool such as it is unprofitable to grow here is grown on the plains west of the Mississippi; but the amount is trifling. The great bulk of the wool which we require is of the merino grade, which we use for our cassimeres, flannels, and delaines; and I trust that as we increase in the development of the length of the staple of the merino, the fabrics which the secretary has referred to will soon be added. Experiments are being made now which I think will lead soon to their extensive manufacture. The other great branch of manufacture is that of worsted goods, of which there is a great and immensely increasing consumption, requiring a class of wool, the value of which alone seems to have been increased by the advance in cotton. We have now no hindrance to that manufacture in this country, save a supply of the raw material. As has been stated, we have hitherto imported from three to five million pounds from Canada; and from that supply we shall be cut off, if the reciprocity treaty is closed the coming spring. What those concerns will then do who have embarked in the manufacture I cannot foresee. We should readily and promptly consume in this country, I think, not less than twenty million pounds of such wools, if we had the supply.

Another class of wools for which we require, for our present consumption, the equivalent of ten or fifteen million pounds, at least, of washed wool—say twenty to thirty million pounds in the condition in which we receive it—are the finer wools, grown in South America, Australia, and the Cape, for the manufacture of goods requiring a close filling and superior finish, which we have been unable to obtain hitherto from any considerable amount of wool grown in this country. Some of the wools grown in Virginia have had these qualities; and when Virginia and East Tennessee come to be settled by Northern men, I hope we shall, from that source, and possibly from some parts of Texas, be able to obtain wools which are adapted to these uses. Until then, we must depend upon foreign markets for our supply. But it is the earnest wish of all connected with the woollen and worsted manufacture, so far as I know, that the growth of these wools should be undertaken; that experiments should be made to ascertain what part of the country is best adapted to them; and that we should have a supply of our own growth.

While I am up, I would allude to a question, the importance of which

I have felt for a great many years; that is, the necessity for a careful study, scientific and practical, of the influence of climate and soil upon wool. All of us here present know that they have an immense influence. What that influence is, has never been settled, I believe, nicely, thoroughly, in this country or any other. In a country so extended as ours, with every variety of climate and soil, it is of more importance than it can be to any other nation in the world. When Professor Agassiz first established his museum of comparative zoölogy, it was a part of his plan to connect with that institution the study of this important subject. The plan he laid out was so vast, that, in bringing it into practical order, he had not reached that when the war began. The war took off a number of young men upon whom he depended to enter with him upon this department of science, and it has thus been delayed. But I hope, when he returns, he will soon be able to take it up there; and the Institute of Technology, also, hopes to devote a part of its attention to the study of that and other matters connected with the practical arts.

Mr. R. G. Hazard, of Rhode Island. When I was up on a former occasion, I referred to the direct interest the wool manufacturer had in the ability of the wool-grower to produce his wool in the cheapest and most economical manner. Perhaps the wool-grower has an equal interest in the ability and skill of the manufacturer to work up the raw material into goods of the greatest possible value. And upon this subject of worsted wools, I think the producer may find encouragement in the fact that the manufacturers are acquiring skill in that direction perhaps more rapidly than in any other. Some of them have alluded to that subject, and seem discouraged in regard to their ability to produce that kind of wool. But the experiments on which this opinion is founded were probably tried when such wools were very much lower in proportion than they are now. There is, however, an important consideration connected with that; and I think it very desirable that this subject should be seen in all its bearings. That consideration is, that those kinds of wools are grown upon large sheep. Now, in this country, the mutton seems to be comparatively a small object. In Great Britain the mutton is the main object, and the wool merely an incidental production. I have no doubt that many of their farmers, if they should hear of our keeping sheep merely for their wool, would appear as much astonished as some of ours are when they hear of Russian farmers keeping pigs for their bristles. That may affect the production of this kind of wool; but, when we become more a mutton-eating people, it may be more judicious for us to raise these large sheep.

Connected with that subject there is a merely theoretical view, which I should like to state, and learn from practical men how far their experience bears out the theory, in regard to the size of sheep, or any other animal. We are all aware that the surface upon which the wool grows increases as the square of the linear dimensions; while the carcass, which has to be sustained to produce that wool, increases as the cube. For

instance, if you begin with the linear dimension two, the square, being four, will represent the surface upon which the wool grows; the cube, which is eight, representing the carcass of the sheep, which has to be sustained. Now, if you double the linear dimensions—instead of making them two, make them four—you have a surface upon which the wool grows of sixteen; and the cube will be sixty-four. In the one case it is as one to two; in the other, as one to four. According to that calculation it would seem that we ought to raise the greatest quantity of wool per acre upon small sheep.

APPENDIX D.

THE CULTURE OF LONG-WOOLLED SHEEP IN THE UNITED STATES.

By Joseph Walworth.[1]

Read before the Wool-Buyer's Association of Michigan, June 2, 1868.

Pacific Mills, Lawrence, Mass., *May* 27, 1868.

Gentlemen: Your favor of the 25th came duly to hand, and in reply would say that if I could I should have been glad to have been at your wool-buyers' convention.

In reply to your questions on combing and delaine wools, I would say that the wool-growers of the country have run too much into the same quality of wool, viz: about three-fourths blood. Now there is a certain amount of this quality of wool needed; but the markets have been flooded with this one kind, while medium or one-half blood and one-fourth blood wools are absolutely scarce. This was largely brought about by the introduction of the black Spanish bucks from Vermont, and the result has been a deal more soggy and inferior-stapled wool for delaine; so that to-day both in Michigan and Ohio many sections that used to yield largely of delaine yield but very little, and the wool is not so desirable nor salable. Let the farmers learn that it is not profitable, neither for them nor the manufacturers, for them to grow black-topped, heavy, soggy Spanish wool; but rather let them grow good stapled bulky fleeces, that are wool, and not 50 per cent. of worthless grease, and let them grow more variety of wools, and not all just about the same quality. There is a great demand for medium or one-half blood wools, and I think it will be a permanent demand.

But as a buyer of combing and delaine wools, I wish to say a few words on that subject. It is a fact there are not near enough combing nor delaine wools grown, and I am satisfied that if we had more of such wools, especially of the well-bred combing wools, the business that now calls for them would increase very rapidly. For if we had more variety of wools, many kinds of goods which are not made in this country at present (owing to the impossibility of getting the right kind of wool) would be manufactured here. Many persons, and especially wool-growers, are not aware of the importance of the worsted business that call for these wools.

In England the worsted business has grown wonderfully during the last 30 years, so that they need more of the worsted wools than they can grow, and they have encouraged the growth of these wools in Holland and some other countries. This business has also increased very rapidly during the last few years both in Belgium and France. Two years since I was in one firm in the north of France where they combed 3,000,000 pounds of worsted wools a year. They combed on commission for the spinners of the surrounding country.

[1] Mr. Walworth is exclusively employed in selecting and purchasing combing wools for the Pacific mills, and his suggestions are of great practical value.

The worsted business is comparatively a new business in the United States. In 1861 there were only three principal firms that used combing and delaine wools, and altogether they did not use over 3,000,000 pounds per year, while now there are 25 firms in the States, and altogether they use 12,000,000 pounds per year. Besides this large increase in the business in this country, we import very heavily every year of worsted goods. Many ask me if the demand for these wools will be permanent, or only transient. I unhesitatingly reply that the demand will not only be permanent, but must continue to increase; and any one will see that it must be so, when I name a few of the classes of goods made from combing and delaine wools, viz: Delaines, bareges, stuff dress goods of all kinds, serge and moreens for skirts and coverings, braid, Italian cloth for gentlemen's coat linings and for uppers for ladies' and children's boots; damask, for furniture coverings, pew coverings, and table-cloths; bunting, for banners and flags; (all the star-spangled banners in America and all other flags, except silk flags, are made from wool;) reins and girths for horses, many sashes for military men, picture cord and tassels, warps for carpets, clouds, Ristori shawls, &c., &c.

Where is the wool grown for these goods? England and Ireland grow the most and best worsted wools. In some parts of France, in Transylvania, Hungary, and Holland—all these places grow a little combing wool, but they are all second-rate wools as compared with the English. In this country, Upper Canada is the principal place. We now begin to get some good wools from Kentucky, Pennsylvania, Maine, New York, and some other scattered points.

The man who grows combing wool has less competition than the man who grows the common merino wool, for England and France need all the combing wool grown in Europe, and they are already competing with us for the Canada wools; so the man who grows these wools has no competition, and he has a permanent and growing demand for his wool, while the man who grows the merino three-quarter blood has to compete with Australia, where it pays to grow these wools at eight cents per pound, and where but a very few years ago they only raised a few thousand pounds of wool. But now they export to England 100,000,000 pounds per year, and are rapidly increasing; they have to compete with New Zealand, where they grow splendid delaines wool; they have to compete with the Cape of Good Hope, where they now export 50,000,000 pounds per year. They have to compete with Buenos Ayres and the rest of South America. They have also to compete with California, Texas, and the cheap lands and prairies of the west. The merino sheep is adapted to run in large flocks, and pays best where land is cheap, and where they keep sheep only for the wool, for they are not a good mutton sheep, and in all the places I have mentioned mutton is almost valueless, while in England and Canada they keep these sheep as much for the value and profit of the mutton as the wool. And owing to the great improvement in the breeding of sheep and cattle, they can now bring sheep to maturity in England much earlier than formerly, and by this means get good young

mutton for the market. Their wool, as a consequence, has improved very much for worsted purposes. It is grown on younger, better bred, better cared-for sheep than formerly, consequently the wool of the same fineness will spin further and better. Wool from old sheep, or sheep that are running out in breed, is brashy, and will work hairy and rough, and make poor goods.

Canada wool has improved fully 10 per cent. during the last five years. Kentucky has taken hold of this business in good earnest, and they are getting good prices and a quick market for both their wool and mutton; and wherever these wools are grown in the States, they are readily sold at good prices. And they are the most profitable wools to grow for those who are adapted to keep such sheep, for the fleece will weigh from four to six pounds of well-washed wool, and the carcass is large, weighing from 150 to 250 pounds each.

These sheep are more profitable to keep than the merino. I extract from the New England Farmer the following: Mr. Winnie, of New York State, fed the last season 901 head of sheep, 180 of which were merinos, the balance Canada Leicesters, and they were sold for $12,049.

To test the comparative profit of feeding the two kinds of sheep, Mr. Winnie set apart 60 Leicesters and 61 merinos, which were weighed February 10. The merinos were chosen from 600, and they were the best of their kind. They were kept till March 28, or 46 days. The following is the result:

	Pounds.
February 10, 60 coarse wools weighed	8,870
March 28, 60 coarse wools weighed	9,878
Gain in 46 days	1,008
Total cost of feed, (hay, grain, oatmeal, roots, &c.,) for 46 days	$174 43

	Pounds.
February 10, 61 sheep fine wools weighed	6,909
March 28, 61 sheep fine wools weighed	7,389
Gain in 46 days	480
Total cost of feed as above	$144 78

If the coarse wooled sheep gained 1,008 pounds at a cost of $174 43, the merinos ought to have gained 836 pounds at a cost of $144 78 for feed—whereas they gained only 480 pounds, or little more than half in proportion to cost.

As compared with live weight, the coarse wools gained 11½ per cent. in the 46 days, and the merinos not quite 7 per cent.

In Brighton market, the day before Christmas in 1839, there were only 400 sheep offered for sale, while the same day, in 1859, 5,400 sheep were sold in the same market. Fine woolled sheep sold from $1 50 to $4 50, while Leicesters sold from $11 upwards, and in 1866, in the same market,

Leicesters sold from $10 to $16 per head. In Cleveland, this spring, I know one farmer who sold 24 Leicester sheep to the butcher for $12 50 a head.

In one market in England, in Norwich, there are sold every Saturday from 6,000 to 8,000 hoggets or yearling sheep, and they sell from $12 50 to $14 50 a head. These are mostly what we call half-bred—that is, some dark faced Down ewe, crossed by a Leicester or Cotswold ram. This makes better mutton than pure Leicester or Cotswold, the meat is not so fat, and the grain is finer, and the half-bred wool is valued in England as highly as any kind.

Now, although it may be most profitable to keep combing woolled sheep, yet it won't do for every one to go into it indiscriminately. Men who wish to have large flocks of sheep—say several thousand—or even a thousand in a flock, ought not to keep these sheep, but will do better with the merino. Men living on the prairies ought not to keep them, for the prairies will not grow combing wool. But I think they should in many parts of Kentucky, Ohio, the hills of Pennsylvania and New York, and in Maine, and in many parts of New England, and in best parts of Michigan. And in particular I would suggest to those farmers who have now in many of the States coarse native sheep, whose wool is common, and does not yield much combing or delaine, that if they would cross these sheep with a Leicester or Cotswold ram—I like the Leicester best—in one year they would receive more than 50 per cent. for their outlay, for their sheep would be larger, and their wool would yield probably 20 per cent. more delaine, or combing, which sells for more and sells quicker, and follow this cross up for a few years, and they might, with very little expense, improve the breed of all such sheep. I do not recommend them to buy very costly rams for common purposes. Let men who make breeding a business buy the fancy bucks.

I would not recommend the farmers in the far west, or in very new countries, to keep these sheep, for in such places the breed is apt to run out, and the wool becomes brashy and hairy, and of very little value. I think Michigan well-adapted for delaine wools of the medium grades. In that branch I have always classed her next to Ohio. Any farmers wanting combing woolled sheep can now find them in many parts of the States as well as Canada. I think Burdett Loomis, esq., of Windsor Locks, Connecticut, has some of the best sheep in the country, and F. W. Stone, esq., of Guelph, Ontario, has a great variety of sheep, and is a large dealer in long-woolled sheep.

Mr. Shields, of Newark, Licking county, Ohio, has tried the experiment on a small scale of keeping these sheep, and has proved it a great success. I saw his wool, and it was equal to any wool I ever saw anywhere. He says it is far more profitable to raise these sheep than the merinos, independent of the great advantage of having so much quicker and surer a market for both wool and mutton.

Yours, truly, JOSEPH WALWORTH.

Messrs. THOMAS McGRAW & Co., *Detroit.*

APPENDIX E.

WOOLLEN MANUFACTURES IN THE UNITED STATES.

The number of sets of machinery or series of cards—a set forming the unit for calculation in woollen machinery—employed in the United States, reported to the National Association of Wool Manufacturers, on the 25th of October, 1865, was 4,100. The estimated number in the United States, as all were not reported at that time, was 5,000. The distribution and weekly consumption of foreign and domestic wool appear in the following table:

Statement of aggregate results, obtained up to October 25, 1865, in reply to circulars of February 24 and May 30, 1865, addressed to wool manufacturers.

States.	Returns received.	Sets reported.	Weekly consumption of scoured wool, in pounds.	Weekly consumption of domestic wool, in pounds.	Weekly consumption of foreign wool, in pounds.	Percentage of foreign wool.	Average weekly per set.	Mills to be heard from.
Maine	40	177	93,835	74,120	19,715	19⅞	530	11
New Hampshire	69	361	217,110	174,841	42,299	19½	601	28
Vermont	39	112	50,217	32,652	17,565	35	448	19
Massachusetts	186	1,467	857,496	560,396	297,100	34½	585	74
Rhode Island	61	340	188,775	152,967	35,808	19	555	15
Connecticut	88	452	252,880	125,486	127,394	50½	559	43
New York	154	576	236,510	174,536	61,974	26¼	411	124
New Jersey	11	64	33,660	25,238	8,422	25	526	7
Pennsylvania:								
Philadelphia	24	68	88,200	68,650	19,550	22¼	1,297	98
Remainder of the State	57	90	39,054	39,054	....	......	434	69
Delaware	6	15	14,050	13,050	1,000	7¼	937	4
Maryland	1	8	5,400	2,700	2,700	50	675	2
West Virginia	......	......	....	....	....	......	......	1
Ohio	44	83	32,615	32,615	....	......	392	34
Indiana	47	103	51,200	51,200	....	......	497	41
Illinois	22	47	23,355	22,355	....	......	497	13
Michigan	20	26	9,660	9,660	....	......	372	12
Wisconsin	13	25	10,800	10,800	....	......	432	6
Minnesota	1	2	1,200	1,200	....	......	600	2
Iowa	15	43	17,658	17,658	....	......	411	6
Missouri	10	21	16,650	16,650	....	......	793	4
Kentucky	7	14	6,600	6,600	....	......	400	7
Kansas	1	3	1,620	1,620	....	......	540	2
California	......	......	....	....	....	......	......	1
Oregon	1	4	4,000	4,000	....	......	1,000	1
Nebraska Territory	......	......	....	....	....	......	......	......
Total, October 25, 1865	917	4,100	2,252,545	1,619,038	633,497	28¼	550	624

The value of the woollen manufacture is shown in the following:

Table showing the value of woollen goods manufactured in the United States for the year ending June 30, 1864.

[Calculated from official report of United States Commissioner of Internal Revenue.]

States.	Manufactures of wool not otherwise provided for.	Cloths, and all textile, knitted or felted fabrics of wool, before dyed, printed, or prepared in any other manner.	Manufactures of worsted not otherwise provided for.	Total.
Maine	$3, 238, 098 67	$238, 385 00	....	$3, 476, 483 67
New Hampshire	9, 044, 762 00	34, 915 00	....	9, 079, 677 00
Vermont	3, 145, 933 67	562, 788 00	....	3, 708, 721 67
Massachusetts	38, 905, 399 00	800, 531 33	$897, 720 67	40, 603, 651 00
Rhode Island	2, 963, 154 33	7, 668, 531 67	261, 014 33	10, 892, 700 33
Connecticut	11, 873, 763 67	3, 913, 965 00	78, 912 33	15, 866, 641 00
New York	10, 850, 180 00	2, 214, 802 67	912, 792 33	13, 977, 775 00
New Jersey	2, 752, 652 00	25, 361 67	70 33	2, 778, 084 00
Pennsylvania	13, 022, 447 33	3, 502, 190 00	75, 076 00	16, 599, 713 33
Delaware	548, 134 67	....	....	548, 134 67
Maryland	450, 385 33	1, 526 67	....	451, 912 00
West Virginia	58, 486 00	5, 267 00	....	63, 753 00
Kentucky	117, 534 33	242, 370 67	....	359, 905 00
Missouri	72, 980 00	2, 364 00	....	75, 344 00
Ohio	1, 315, 243 00	85, 634 67	....	1, 400, 877 67
Indiana	545, 128 33	11, 794 33	1, 692 67	558, 615 33
Illinois	341, 907 00	11, 384 00	5, 793 33	359, 084 33
Michigan	118, 094 00	33, 754 33	....	151, 848 33
Wisconsin	104, 457 67	860 00	....	105, 317 67
Iowa	102, 815 67	15, 489 67	....	118, 305 33
Minnesota	8, 696 00	450 00	....	9, 146 00
Kansas	14, 947 67	....	....	14, 947 67
California	538, 956 00	....	....	538, 956 00
Oregon	128, 620 67	....	....	128, 620 67
Nebraska Territory	45 67	....	....	45 67
Total	....	....	....	121, 868, 250 33

THE PACIFIC MILLS, LAWRENCE, MASSACHUSETTS.

Paper presented at the Paris Exposition.

This paper is a statement written in response to a call from a jury of the Paris Exposition for distinct illustrations concerning "persons, establishments, and localities, which, by a special organization or special institutions, have developed a spirit of harmony among all those co-operating in the same work, and have provided for the material, moral, and intellectual well-being of the workmen."

"Pacific mills" is the corporate name of a joint-stock company devoted to the manufacture, from the raw staples, of ladies' dress goods of cot-

ton wholly, of worsted wholly, and of cotton and wool combined, and the printing and dyeing of the same. It is located in Lawrence, State of Massachusetts, United States of America, 26 miles from Boston. Its post office address is, "Pacific Mills, Lawrence, Massachusetts, United States of America."

J. Wiley Edmands, Boston, is the treasurer of the company, and Wm. C. Chapin, of Lawrence, the local agent or manager. The management is confided by about 150 stockholders to nine directors, chosen annually.

The original number of shares of the company was 1,000, costing $1,000, or 5,000 francs, each, making a total capital of $1,000,000, or 5,000,000 francs. The cost of the buildings and machinery having exceeded this sum, 1,500 shares more, at same cost, were issued, making the total number of shares to be 2,500, and the cost of the capital $2,500,000, or 12,500,000 francs.

They commenced operations near the close of the year 1853, but no goods were ready for market until the spring of 1854. The amount of machinery then consisted of 1,000 looms, with carding, spinning, and dressing machinery sufficient to supply them, together with combing machines and spinning for worsted yarn, used in the manufacture of mixed fabrics, and was equal to the production of about 200,000 yards weekly of calicoes and mousseline de laines, with 10 printing machines for preparing these goods for market.

The buildings and machinery have been since increased, so that there are now in operation about 100,000 spindles for spinning cotton, with cleaning, picking, and carding machines to supply them, and about 16,000 spindles for worsted, with all the necessary preparing machines to occupy 3,500 looms for weaving the two classes of goods above named and others, together with 18 printing machines, producing a weekly average of about 700,000 yards. The machinery is propelled by eight turbine wheels, six of them being 72 inches in diameter, and two 84 inches in diameter, with a fall of water equal to 26 feet, yielding 1,500 horse-power.

The average sale of the manufactured goods of the company for a few years past exceeded $7,500,000, or 37,500,000 francs. About 3,600 work-people are now employed by the company. Of these there are 1,680 men, 1,510 women, 80 boys between 10 and 12 years, 140 boys from 12 to 18 years, 40 girls from 10 to 12 years, and 150 girls from 12 to 18 years.

In the origin of the establishment the principle was adopted by the managers that there was to be a mutual dependence between employers and employed, each having rights which the other should respect, and that, inasmuch as the success of the proprietors must depend much upon the cheerful and intelligent co-operation of the work-people, certain plans were adopted to secure "the material, moral, and intellectual welfare of the workmen," both as a duty to them and one of self-interest to the proprietors.

MATERIAL WELFARE OF WORKMEN.

For the material well-being of the laborers, special care was used in the original construction of the workrooms to make them cheerful, comfortable, and well ventilated, so as to avoid, as far as possible, the unpleasant drudgery of work, and to secure order and neatness throughout. Houses were constructed for dwellings which should give to families residences at moderate cost of rent, that would secure the health and comfort of the work-people, while they were cheerful and attractive. Men pay for these houses a weekly rent about equal to one-eighth of their wages. Large buildings were erected for the use of single females whose residences were at a distance, and divided into 17 large apartments, capable of accommodating 825 persons in the aggregate. The rooms are arranged for two persons each, well ventilated and lighted, and comfortably furnished. Unmarried men are never allowed to lodge in these houses, nor in any case a married man, except he is accompanied by his wife, and then but rarely. Females pay about one-third of their average wages for rooms in these boarding-houses, including food, lights, and washing. Fuel for fires in their rooms is an extra expense. It is common to provide coal, and sometimes flour, to the work-people at the cost price of large quantities.

Another effort for the material welfare of the operatives was adopted in the earliest history of the enterprise, and has been continued for nearly 13 years, with marked success, doing much to promote "harmony among all those co-operating," and to establish a bond of sympathy and union.

An association was formed, called "Pacific Mills Relief Society," of which each person employed by the company must be a member, the entire management thereof being in the hands of the work-people, each officer being chosen by themselves from their own number, excepting the president, which office has always been filled by the resident agent or manager, who rarely acts, however, except as counsellor or umpire.

Each person on commencing service elects whether he shall pay two, four, or six cents per week to the relief fund, the lower sum being a little more than $\frac{1}{100}$th part of the weekly average wages of those who are the youngest, and consequently least paid, and the highest sum, six cents weekly, bearing the same proportion to the average weekly wages of the entire body of work-people. When the sum in the hands of the treasurer of the society, who is always the confidential clerk of the company, and keeps the deposit with the company for protection, has reached the sum of $1,000, the weekly subscription of all persons who have been employed by the company three months ceases, while it continues with the new comers.

This condition of funds occurs so often that for nearly one-half of the time the older employés are not assessed, and the real sum withdrawn from their wages annually is a very small proportion of their wages, and is far from being a burden to the poorest.

When a person has been in the employ of the company three months, and, consequently, for that time paid his elected sum to the funds of the relief society, he becomes a full member of that society, and entitled to certain privileges. If sickness occurs, preventing him from labor, and he sends notice to the overseer, or head workman of his room, one of the appointed stewards is sent to learn the nature of the illness, and the sick one becomes the special charge of this steward, who, for a man, is one of his own sex, or, if a female, a woman, and it is this steward's duty to see that a nurse and physician are secured, if necessary, and to draw from the wardrobe of the society such changes of personal and bed linen as the circumstances demand.

Each sick person, if the illness continues one week, is thenceforward granted an allowance from the funds of the society. He who has paid two cents per week for at least three months receives $1 25 weekly for the period of 26 weeks, if sick so long. Double this sum is allowed if four cents have been paid, and $3 75 when the amount paid has been six cents weekly. In cases of special need the officers of the society are authorized to make an extra allowance, though great care is used in such a dispensation. Those who die poor have their funeral expenses paid, and are respectably buried in the beautiful lot in the city cemetery belonging to the society. In some cases the deceased has been sent to his native town by the desire of his friends, without cost to them, if they were poor.

Sick members are often accompanied to their friends by a steward, or the overseer of their work-room, when too feeble to go alone, or the friends too poor to come for them. The blessings of this society are thus made known to parties at a distance, and it often induced persons of excellent character to seek employment of this company, while those who have secured the benefits of the relief society retain it in warm remembrance. More than one poor mother, whose only child, while a member of this society, has been disabled by sickness, has found the weekly allowance an invaluable aid to her slight income, and called loudly for blessings upon its officers and the institution with such a work of merciful kindness. Many a father and mother, or other relative, whose child or friend has been sent to this company, have besought the blessings of Heaven upon the members of this society, who have cared for their absent ones in the time of sickness, and soothed them as they have faded away from life.

Though there is not space for details of great interest, it must be seen that this plan has a direct tendency to promote sympathy for each other among the work-people, and to secure a bond of union. Most surely those who daily observe its workings see it.

It will also be noticed that a very important feature of this plan is that it is an association of the work-people themselves, wholly controlled by them, and consequently sure of permanency while favored to its present extent by the employers. This is likely to continue, because they witness its important influence and usefulness.

The total amount of money expended for the benefit of sick members in 12 years of its existence, ending in April, 1866, has been $25,530 68, or 127,653 francs, to 1,868 persons, and the amount paid to the fund in the same time has exceeded this sum about $1,200. The corporation contributes weekly to this fund, and also to meet individual cases which are specially aggravated.

MORAL WELFARE OF WORKMEN.

To meet the protection of the large number of single females employed by the company, who, as is often the fact in the manufacturing establishments of the United States, and perhaps elsewhere, are away from the guardianship of their friends, the boarding-houses referred to above are controlled by persons carefully selected for their ability to influence this class of work-people, and for their established good character, who will take an interest to secure the comfort of their boarders, and save them from bad moral influences, acting really, as far as possible, in the place of guardians. If a young female is known to visit places of evening amusement of doubtful character, or gives any reason for suspicion that she is guilty of immorality, or even of careless, unguarded conduct, she is admonished, and if reform is not immediate she is discharged from the house and from employment. The doors of the house are locked at 10 o'clock at night, and no one allowed to be out after that hour without a satisfactory excuse. Doubtless persons of immoral character secure employment by the company, and by superior secresy retain this connection. Among so large a number some will be impure, but it is believed that very few of these females are led astray while connected with the mill, if virtuous when commencing work. It is impossible for an openly vile person to retain connection with the company.

Men of intemperate habits, or of general bad character, are excluded from the company's service, though patience with them is encouraged, with the hope of securing reform; and this forbearance, and attendant labor, has often been rewarded. It is an established principle that all profanity or other bad language, and any bad example or severe use of authority among the head workmen, must be strictly avoided, especially when these overseers have in their charge females or young persons. More than one such responsible workman has been removed for using improper words or ill-treating his subordinates. It is absolutely demanded of these persons that they treat those under them as they would desire to be treated themselves if in their position.

The directors have placed their associate, the manager, at the works to represent their feelings to the work-people; to show them sympathy in their trials, to counsel them in their need of advice, and to be their friend.

Careful efforts have been made by him to secure their confidence, and he has cultivated the conviction that they could ever find in him a father,

brother, or friend. Many hearts have been moved to earnest gratitude for the aid which they have thus secured in their time of need. It requires a vast amount of patient listening to complaints, to tales of sorrow and want; but it has had its reward in seeing so many relieved, made glad and hopeful.

The real moral effect, and the real satisfaction in such a relation between employer and employed, cannot be written. The spirit of the employer is imparted to the more responsible and influential workmen, and to those under them, while a healthy moral condition is secured.

INTELLECTUAL WELFARE OF WORKMEN.

When the company was first established the directors appropriated $1,000, or 5,000 francs, for the purchase of suitable books for a circulating library, and provided a suitable room for it on their premises. The work-people have always been required to pay one cent each week during their service, and they thus become members of the "Pacific Mills Library Association," which is managed entirely by themselves, they choosing their own officers for the control of its affairs and for the selection of books, but selecting the resident manager for the president and chairman of the library committee. This weekly payment secures the privilege of the use of the library and reading-rooms of the society. One room is appropriated to males, and is supplied with the local newspapers of the city, and of Boston and New York, together with numerous serials of a scientific and literary character, and is open from 6 o'clock a. m. till 9 o'clock p. m., warmed and lighted. It is in close proximity to the other room containing the library, now exceeding 4,000 volumes, and also a cheerful, airy, comfortable apartment for the females, which is carpeted, and made attractive by daily and weekly publications especially adapted to their wants, and stereoscopes with numerous slides, all in charge of an intelligent and cultivated young lady. It is open from 9 o'clock a. m. till 9 o'clock p. m., and is much frequented and valued.

A large number of volumes of the library are in constant circulation, as the number of the work-people who cannot read or write does not exceed 50 in 1,000, and these are universally of foreign birth. All new publications adapted to this class of readers are bought as soon as published. The privilege of taking books from the library is extended to members of families whose head is a member of the association. The funds of the society are also used to purchase tickets of admission to lectures and suitable popular amusements, which are distributed among the members.

This association, as well as the relief society, it will be seen, is supported and managed by the work-people themselves, who secure a valuable return for their small outlay, and also the permanency of its operation, avoiding the dependence for existence and usefulness upon the life, or even connection, of any one person of special prominence.

A law of the State forbids the employment of children under 10 years, and requires that children employed between 10 and 12 years of age shall be in school 16 weeks in each year, and those between 12 and 16 years 11 weeks. The company contributes annually to the support of an evening school for both sexes.

SUCCESS OF THIS CO-OPERATIVE ORGANIZATION.

It has often been stated that care of employers for the elevation and welfare of their operatives, especially to the extent herein shown, is incompatible with pecuniary success. Facts prove that this is not true with the Pacific mills, but others must determine how much of this is due to the principles of action established and maintained.

It is also believed that the work-people have received great benefit.

Some of the evidences of this are the following:

1. There have been no strikes among the work-people, which are their curse, and the dread of employers. They have been encouraged to feel that any grievances will be patiently listened to, and frankly discussed, and the result has always been favorable to good order.

By no means has every uneasy spirit been quieted, but the mass has been satisfied.

2. A higher class of workmen has been secured. Those best able to appreciate the privileges enjoyed in connection with this company have been drawn thither for employment. Specially is this true among the overseers, who engage the laborers in their different departments, and give character to the mass. Their intelligence and hearty co-operation in the plans for the material, moral, and intellectual advancement of the operatives, moulds the whole, and secures a higher standard. The general influence of the principles adopted by the company leads these prominent workmen to feel that they are intrusted with a degree of guardianship of those under them, and this feeling is very manifest. Respect for the manhood of a workman moulds him.

3. Many of the work-people have invested their funds in savings banks, and this is specially encouraged. Formerly the company received deposits themselves from the work-people, allowing an annual interest of six per-cent.; but for some prudential reasons this plan was abandoned, and the depositors encouraged to invest in chartered banks. The company held in their hands at one time more than $100,000, or 500,000 francs, of the earnings of their work-people, which has been changed into other channels. There is no doubt that their deposits now exceed this sum largely.

4. Quite a number of the work-people own houses free of debt, while others have been partially assisted by the company, it reserving a portion of their wages each month in reduction of the debt. More than $50,000, or 250,000 francs, are thus invested.

5. Others invest their funds in the bonds of the United States government in preference to savings banks.

6. Several of the workmen are owners of the stock of the company, and

have the same rights in regard to the control of the officers and general management as other stockholders. Their stock has now a market valne exceeding $60,000.

7. Investment of earnings in premiums on life insurance has been made by many of the workmen.

8. More than one of the workmen has been a member of the city government in its board of aldermen and common council, and not an annual election passed without the choice of one, or more, to some of these important offices.

9. The pecuniary success of the company has warranted a liberal spirit in the payment of wages to the work-people. The least sum now paid in weekly wages to the youngest employé is $1 82, gold, a little more than 9 francs, and the number belonging to this class is very small. Boys of 16 years do not receive less than $2 85, gold, weekly, or more than 14 francs.

The least amount paid weekly to men is $6 75, gold, or nearly 34 francs, while a very large majority receive much more. Females receive from $2 48, gold, weekly, or about 12.50 francs for the least, to $6 72, gold, or more than 33 francs; while a few earn more. This excepts young girls, whose wages are the same as the least sum named above. Spinners, weavers, and a few others are paid in accordance with their product, some of them earning very large wages.

The stockholders, as previously stated, have invested $2,500,000 in the company. During the past 12 years they have received in dividends more than $3,000,000, and the fixed property has cost a much larger sum than the amount of the capital stock. The treasurer furthermore holds in his possession a very large amount of undivided earnings with which to purchase cotton, wool, and other materials, for cash.

APPENDIX F.

THE WOOLLEN AND WORSTED TRADE OF GREAT BRITAIN.

Description and statistics from the third report of the commissioners appointed to inquire into the best means of preventing the pollution of rivers, (rivers Aire and Calder,) presented to both houses of Parliament by command of her Majesty, 1867.

A glance at table D of the interesting and valuable returns (page 134) will inform the reader that woollen and worsted products to the extent of 384,200,000 pounds in weight, and of a value of £64,400,000 sterling, are annually sent out of the mills of Great Britain.

The West Riding of Yorkshire is not the only district in which this vast industry is located, but it may safely be taken that from one-half to two-thirds of the woollen and worsted trade is carried on there.

This trade is of ancient date in England. The Romans had weaving establishments of woollen cloth at Winchester, where the copious springs from chalk afforded means both for power and for washing and dyeing. The mother of Alfred the Great is recorded to have been skilled in spinning wool. Flemish woollen weavers settled in England about the time of the Norman conquest, and continued immigration of woollen weavers from Flanders took place in the reigns of Henry I, Henry III, Edward I, and Edward III. The woollen tissues first spun and woven at Worsted in Norfolk, about the year 1388, became the staple trade of Norwich. Devonshire manufactured woollens soon after the introduction of the trade into England, and Worcestershire a little later. Friezes were also early manufactured in Wales. In the middle of the sixteenth century Berkshire took the lead in woollen manufacture.

About the middle of the last century the West Riding of Yorkshire became the seat of the worsted and woollen trades. Halifax began to be specially noted for kerseys. From about this date these trades finding so much water available, not only for power, but also for washing, dyeing, scouring, fulling, and all other purposes, the Yorkshire manufacturers and traders were enabled to undersell those of other places.

The rivers Aire and Calder were made navigable by act of Parliament about the year 1698, and have from time to time been improved so as to meet and supply the requirements of a growing trade. This navigation has such advantages and has been so ably managed up to this date that it successfully competes with the established railways.

It is of the utmost importance to study the rise, progress and condition of any manufacture, especially if it has changed its locality. Successful trade is generally contingent upon local natural advantages which forethought and care may improve, or which continued abuse may deteriorate and even ultimately destroy. The West Riding of York-

shire, and especially the Aire and Calder district, possesses many natural advantages favorable to the establishment and conduct of trades requiring good water. A range of mountains composed principally of scar, limestone, and Yoredale rocks, capped with millstone grit, forms the western boundary, and sends down numerons spring-fed rivulets and streams to wind and flow over the entire breadth of this portion of the county. The graduated fall affords means of obtaining water power, and the numerous valleys offer favorable sites for storage reservoirs. The vast numbers of mills and dyeworks (upwards of 5,000) established since the commencement of the present century, and the rapid growth of the worsted and woollen trades of the West Riding, clearly indicate that the natural advantages of this part of Yorkshire are great. There are not only spring and river water, but there is also cheap fuel obtained from the local coal field, enabling the manufacturers to supplement water power with steam, and in nnmerous instances to obtain all the power required from steam alone. Abuses in the district by throwing solids into running waters and by pollution have, however, become in some cases destructive to trade, and in numerous cases prohibitive to further extensions, some branches of trade having migrated to Scotland, where water less polluted is obtainable.

The varions processes to which water is pnt in cleansing wool and in manufacturing woollens and worsteds, may be stated as follows:

1. Scouring the wool with a ley and hot water to remove grease and dirt.
2. Washing with clean cold water.
3. Dyeing when the cloth is to be wool-dyed.
4. Scouring cloth with fuller's earth to remove oil and size.
5. Dyeing when piece-dyed.
6. Milling or fulling with soap and warm water, either in the fulling stocks or in the improved milling machines, where the cloth is squeezed between rollers.
7. Scouring to remove the soap.
8. Boiling cloth to give it a permanent face.
9. Steaming to take away the liability of the finished cloth to spot.

Dirty water may be used for power, but even for such purpose it is a nuisance, and for washing and dyeing water may be so polluted as to be injurious even to dark and coarse goods, and totally unfitted for cleansing and dyeing fine fabrics.

The vast interests involved in the wool, woollen, and worsted trades of Great Britain are set forth in the following statistical tables kindly furnished to the commission by Mr. Jacob Behrens, vice-president of the Chamber of Commerce of Bradford.

TABLE A.—*Estimate of the produce of wool in the United Kingdom from 25,795,708 sheep, based upon a return made for Great Britain on the 5th of March, 1866, and for Ireland in 1865.*

	Number of sheep.		Weight per fleece.	Wool produced.
	Under one year old.	One year old and above.		
			Pounds.	*Pounds.*
In England	4,505,345	10,620,196	6½	69,031,274
In Wales	380,854	1,287,809	5½	7,082,250
In Scotland	1,624,638	3,630,439	6½	23,597,853
In Ireland	1,048,491	2,640,251	6	15,841,506
Isle of Man and Channel islands	24,410	33,196	6½	215,774
Total	7,583,817	18,211,891		
Under one year old hoggets	5,583,817	....	6	33,503,293
Lambs killed and clipped	1,000,000	....	3	3,000,000
Lambs killed and not clipped	1,000,000	....	....	....
Total	....	....	....	152,272,650

MEM.—The number of sheep in Ireland under one year old is supposed to bear the same proportion to the whole number as that given in the return for Great Britain.

TABLE B.—*Estimate of the quantity and value of wool and similar material worked up in worsted and woollens.*

Articles.	Produce and imports.	Exports.	Retained for home consumption.	Price per pound.	Value.
				£ s. d.	
English wool	152,272,650	7,320,299	144,952,351	0 2 4½	£17,213,075
Foreign wool	206,473,045	55,993,803	150,539,242	0 1 6½	11,123,905
Goats' hair or wool	4,737,330	....	4,737,330	0 2 8¾	650,191
Home-made shoddy	52,000,000	....	52,000,000	0 0 5	1,083,334
Imported shoddy	22,482,880	....	22,482,880	0 0 4¼	494,611
Wool extracts	5,000,000	....	5,000,000	0 0 6	125,000
Foreign yarn	4,479,984	....	4,479,984	0 4 6	1,008,004
Total	447,445,889	63,254,102	384,191,787	....	31,698,120

MEM.—Imports, exports, and values from Board of Trade tables for 1864, except quantity of English wool, for which see A.

TABLE C.—*The exports of wools, tissues, and yarns, and the quantity of foreign wool worked up in the years 1844, 1854, and 1864.*

Description.	1844.	1854.	1864.
Exports of English wools	£535,134	£734,490	£673,446
Exports of worsted yarns	958,217	1,557,459	5,417,377
Exports of wool tissues	8,204,836	9,121,186	18,533,457
Exports of British produce	50,642,306	97,092,308	160,449,053
Foreign wool retained for home consumption .... lbs.	63,741,087	81,654,711	155,276,572

Comparative percentage of the exports of worsted and woollen manufactures to the other textile fabrics in 1864.

Description.	Value.	Per cent.
Exports of worsteds	£16,217,898	*17½
Exports of woollens	7,732,976	*8½
Exports of cottons	54,882,329	59
Exports of linen and jute	11,636,049	12½
Exports of silks	2,274,927	2½
Total	£92,744,179	100
Total exports of British produce	£160,449,053	....

* Six per cent.

TABLE D.—*Estimate of the value and weight of wool and similar material manufactured into worsted and woollen yarns and tissues in the United Kingdom*, 1864.

Description.	Pounds.	Value.
English wool, exported as yarns	35,000,000	£5,500,000
English wool, manufactured into tissues, 4*s*	110,000,000	22,000,000
Foreign wool, manufactured into tissues, 3*s*	150,500,000	22,600,000
Mohair wool, manufactured into tissues, 5*s*	4,700,000	1,200,000
Foreign yarn, manufactured into tissues, 8*s*	4,500,000	1,800,000
Shoddy and extracts, manufactured into tissues, 1*s*	79,500,000	4,000,000
Cotton, yarn, and other material	....	7,300,000
Total	384,200,000	£64,400,000

TABLE E.—*Estimate of the value and weight in* 1864 *of the wool and similar material worked up with it into worsted and woollens for export and home consumption.*[1]

WORSTEDS.

Description.	Pounds.	Value.
EXPORTS.		
Yarns, (31,824,296 pounds,) equal in wool to	35,000,000	£5,417,377
Goods, one-fourth mixed with other materials, £6,000,000, wool, 4*s*	30,000,000	7,945,633
Goods, all wool, 4*s*	14,000,000	2,852,815
HOME.		
Goods, mostly mixed with other material, 4*s*	66,000,000	13,200,000
Goods of mohair, mostly mixed with other material, 5*s*	4,700,000	1,200,000
Cotton and other material worked up with the above, exclusive of exports	....	2,984,175
Total	149,700,000	£33,600,000

[1] In this estimate all English wool is considered as worked up into worsted, and that which is worked up into woollens is supposed to be more than balanced by the foreign wool (Russian, Australian, and others) in worsteds.

TABLE E—Continued.

WOOLLENS.

Description.	Pounds.	Value.
EXPORTS.		
Goods, mixed with one-fourth of other material, £890,000, 1s	18,000,000	£1,186,815
Goods, all wool, (foreign,) 3s	43,500,000	6,546,161
HOME.		
Goods of foreign wool, 3s	107,000,000	16,000,000
Goods of foreign yarns, 8s	4,500,000	1,800,000
Goods, shoddy and extract, 1s	61,500,000	3,200,000
Cotton and other material mixed with wool		2,067,024
Total	234,500,300	30,800,000

Under the name of shoddy, which occurs so conspicuously in the foregoing tables, an enormous weight of material is used which, until recently, was waste. Shoddy was first introduced into use about the year 1813, at Batley, near Dewesbury. Mungo was adopted in the same district, but at a later period. Shoddy is the produce of soft woollen rags, such as old worn-out carpets, flannels, Guernseys, stockings, and similar fabrics. Mungo is the produce of worn-out broad or similar cloths of fine quality, as also of the shreds and clippings of cloth. It was stated at our inquiry that the term arose in consequence of the difficulty at first of manipulation. A manufacturer gave some of the materials to his foreman, who, after trial in the shoddy machines, came back with the remark, "It winna go;" when the master exclaimed, "But it mun go!" These woollen rags are collected, packed in bales, and are imported from Russia, Egypt, Turkey, the entire area of Europe, India, China, and, in fact, from all parts of the world where woollen garments are worn, and rags produced and can be collected. They come to Yorkshire from districts where plague, fever, small-pox, and loathsome skin diseases extensively prevail. The bales are opened and the rags are sorted by human fingers before being placed in machines, which break up, tear, separate, and cleanse the fibre for manufacturing uses. According to the evidence we obtained no disease has ever broken out among the persons who so manipulate these old woollen rags, although in many of the countries in which they are collected they are believed to be peculiarly plague-bearing materials. The lapse of time in collecting, storing, and transmitting these rags, as also the possible destruction of any special poisons, by friction or otherwise, must be taken into account. The whole of the facts deserve, however, the serious attention of those persons who insist that the power of communicating disease is contained in a dangerous manner by woollen goods which have been worn by persons suffering from contagious diseases. The experience obtained by

the manipulation of shoddy, for upwards of 50 years, proves that old woollen rags are not in any degree dangerous to the health of those who work among them.

The shoddy trade, as now carried on in the West Riding, is a remarkable instance of the utilization of waste material. The term "shoddy" was, in the first instance, one of reproach, but this has ceased to be. Shoddy now enters into honorable companionship in official returns with British and foreign wools, mohair, silk, and cotton, and is used by manufacturers throughout the woollen and worsted districts. By recent returns (1866) the total weight of wool and goats' hair—of home and foreign growth—used, was about three hundred and ten millions of pounds; the total weight of shoddy and extracts for the same period was about seventy-four and one-half millions of pounds, or some thirty-three and three-quarter thousand tons; so that shoddy now forms near one-fifth, by weight, of the woollen and worsted manufacture of the district. The woollen trade of Great Britain could not be carried on to its present extent without shoddy.

Shoddy is mixed with wool in proportions from one-third to two-thirds shoddy or mungo, and is used in the manufacture of cheap broadcloths, fine cloths for ladies' capes and mantles, pilots, witneys, flushings, friezes, petershams, duffels, houleys, paddings, linings, cloths used for rough and loose great-coats, office-coats, and trousers, pea-jackets, and blankets. A considerable quantity is used in the form of flocks for beds. Felted cloth is extensively manufactured; it dispenses with spinning and weaving, depending on the felting property of wool by reason of the curl in the fibre. The process is carried on by the aid of warm moisture, pressure, and milling; such cloth is used for table-covers, horse-cloths, carpets, paddings, druggets, and the coarser and thicker kinds for covering steam boilers, steam pipes, and ships' bottoms beneath the copper. Some of the finer and better class of felted cloths are printed.

The manufacture of shoddy and mungo need not produce any special pollution. The rags are torn into fibre by machines specially prepared, and the dirt, dust, and fine particles of wool are blown out in such manner that this refuse can be collected and sold for manure. About one-seventh, by weight, of shoddy is so cleaned out as waste in preparing it. The price obtained for it as manure varies from 10*s.* to 20*s.* per ton. Some of the richer sort of waste shoddy is sent into Kent as a dressing for hop-growing.

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PARIS UNIVERSAL EXPOSITION, 1867.
REPORTS OF THE UNITED STATES COMMISSIONERS.

REPORT

UPON

COTTON,

BY

E. R. MUDGE,
UNITED STATES COMMISSIONER,

WITH A

SUPPLEMENTAL REPORT,

BY

B. F. NOURSE,
HONORARY COMMISSIONER.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1869.

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APPENDICES.

ERRATUM.

Page 19, line 18, for "adequate," read *inadequate.*

COTTON.

REPORT OF THE SUB-COMMITTEE.

FROM THE COMMITTEE ON RAW MATERIALS AND THE MANUFACTURE THEREOF, ETC.

The few samples of cotton exhibited from the United States were not worthy of special mention as representing this great staple. The "Cotton Supply Association" of Manchester, England, had, however, prepared and sent to the Exposition some cases, in which were arranged, suitably for comparison and contrast, samples of all the cotton of the world—that is to say, samples from every country and of every kind from each country, whence was produced the cotton which made up the commercial supply of the world for the past year. The Committee regarded this, as in itself, a literal and truthful exhibition of the cotton "of all nations," and therefore a better and more convincing report than anything descriptive that could be written to show the present position of our country in relation to others in cotton growing. By the aid and courtesy of the secretary of the Manchester Cotton Supply Association, a similar collection of samples, but more full and complete, was prepared at Manchester by request of the Committee, and is hereby submitted in connection with this report, and with the suggestion that the two cases containing the collection be placed for preservation and reference in one of the public offices at Washington. In the two cases are 154[1] samples from more than 40 different countries or localities, and 12 samples of cotton seed.

During the progress of our civil war the scarcity of cotton carried prices very high, reaching in Liverpool to 31*d.* per pound for middling Orleans, and 24*d.* for fair Surats. The high prices and extraordinary demand thus created caused and extended the cultivation of cotton throughout the world wherever the proper physical conditions existed.

In 1860 the cotton product of the United States supplied home consumption, and 85 per cent. of that of Europe.

In 1864 the United States imported cotton from Liverpool and from some producing countries, and of the consumption of Europe less than 10 per cent. was of the growth of the United States.

Two remarkable effects resulted during this period: first, the improvement and adaptation of machinery for spinning the short staples of India, China, Japan, &c.; second, an improvement, still more important as favoring their use in the place of American cotton, obtained in the character of their staple by the use annually of American or Egyptian seed. This change of seed has produced in the east cotton which approaches

[1] See list of these appended hereto.

closely our upland cotton in spinning value. A further change for the better has been made in the preparation for market of the great bulk of India cotton, which formerly was so badly charged with field waste and other dirt that the classifications of American cotton could not be applied to it.

This adulteration has been lessened very materially. Thus it appears that the improved character of the cotton, in staple and cleanliness, concurs with the improved machinery and methods of use, to make India cotton approximate much nearer the value of American cotton for all coarse and medium work than before the war.

British India is our chief competitor in supplying the world with cotton We have noticed their relative improvement during our disability. It should be noted here that our country offers a higher price for labor than any other. The cotton-growing States cannot be an exception. Other countries that produce cotton to any considerable extent, such as Egypt and India, have labor at the lowest price—that of a cheap subsistence. The position of the planter in America should be contrasted with that of the planter in India, both hiring labor, the one at the practical cost of $25 per month, the other at a cost of $25 per year. A like contrast should be made between the ryot of India and the farmer of America, such as it is hoped and believed will be most of our southern citizens, both white and black, who have no labor but their own and their families, when the only salable product of their few acres shall no longer be taxed.

The annual cotton statistics of the United States are made up to 1st September. It is the point of time between the old crop just gone and the new crop just coming in. It is a fair time at which to take the annual average price.

Middling cotton was worth in New York—

	1861.	1862.	1863.	1864.	1865.	1866.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
September 1	22	52	67	187	45	35
Average of the year ending September 1	18	43¼	76	117	60	38

Owing to the great fluctuations in the rates for sterling exchange, or gold, the price at New York varied from that in Liverpool, where cotton statistics are made at the end of the year, when the price was for middling Orleans:

	1861.	1862.	1863.	1864.	1865.	1866.
	Pence.	*Pence.*	*Pence.*	*Pence.*	*Pence.*	*Pence.*
December 31	12	22	27¼	27	21	15
Average of year	7¾	16	23¼	26¾	19	15¼

For the five years, 1856–'60, the average consumption of cotton in the world was, per annum—

In Europe..................	3,755,000 bales, or	1,574,700,000 pounds.
In the United States........	720,000 bales, or	331,300,000 pounds.
Total amounts..........	4,475,000 bales, or	1,906,000,000 pounds.

Of which was grown in the United States 3,585,000 bales, or 1,606,000,000 pounds, equal to 84.26 per cent. of the whole.

In 1864 the whole import of cotton into Great Britain was 2,587,000 bales, of which only 197,000 bales, or less than eight per cent. (7.62) were of United States growth; while other countries supplied 92.38 per cent., or 2,390,000 bales, so rapid was the increase in their production.

In 1865 and 1866, countries other than the United States supplied 83.28 per cent. and .69 per cent. respectively, or 2,293,000 bales, out of an import of 2,755,000 bales, and 2,587,000 out of an import of 3,750,000, notwithstanding that 50 per cent. had been lost from the highest price, or from 31 pence per pound in 1864 to 20 pence in 1865, and 15½ pence in 1866.

At this time (August, 1867) the value of cotton is still declining. In England the decline encountered already since the close of our war has been most disastrous to importers and others dealing in cotton; and it is believed that prices will fall to or below seven pence per pound for fair Dhollerah, (Surats,) and nine pence per pound for middling New Orleans, which last price would be equivalent to 20 cents per pound in New York, or 19 cents per pound in New Orleans. The import to Europe (principally to Great Britain) from India is already large, and will probably exceed 1,500,000 bales for this year, or nearly the same as last year; while the crop of the United States for 1866–'7, including the stock remaining September 1, 1866, will hardly exceed 2,000,000 bales, from which 700,000 must be taken for home use, leaving for export only 1,300,000 bales, or less than the supply to Great Britain from India alone.

Thus it appears that while prices have fallen so far, and are yet falling from year to year, the production of cotton in other countries is continued on a scale so large that a large surplus remains over at the end of each year, and the United States crop supplies only about 35 per cent. of the European consumption.

It is estimated that our crop this year will be more than 2,500,000 bales, if the picking season be favorable, and that other countries will produce as much as the average of the last three years, if not more, which may be shipped to Europe in greater or less quantities, as the prices shall be higher or lower. Should these estimates be sustained by the fact, it seems to follow as a necessity of the bad state of the trade that prices shall decline to a range below a just value in view of the probable future supply, and far below the cost to the planter who has hired labor to make his crop. For the moment, the effect of so great

cheapening of prices is to lessen the demand instead of increasing it, because the business of manufacturers, which is the source of demand for consumption, is itself suffering and unprofitable under a great decline in the value of their products, and the trade insists upon further concession in view of the present and impending decline in the raw material.

Suppose cotton shall decline to 20 cents per pound for middling in New York. This would return to the planter only 16 cents on his plantation, and the planter who has been able to make his crop with hired labor at a cost not exceeding 16 cents must have had very favorable conditions.

If the price shall be only 16 cents in New York, (which should not be regarded as impossible in view of the possible supply, and the fact that the average price before the war was for many years below 10 cents,)—if the price shall be only 16 cents in New York, or 12 cents to the planter, he cannot pay his hired laborers with the entire net proceeds.

A tax of 2½ cents per pound on 16 cents, if the planter shall get so much, is equal to 15⅝ per cent. and on 12 cents is 20⅚ per cent.[1]

When the first excise tax of 3 cents per pound was laid upon cotton, middling American cotton was worth 50 cents per pound. At such a price there would have been great profit in cotton growing, if fair crops were obtained, and the tax would have been lightly felt. The price fell to 35 cents the following year, notwithstanding such a failure of the crop as left that price unremunerative, and at the close of the last session Congress reduced the tax to 2½ cents per pound.

When Congress again assembles the price of the new crop will be known, and the proportion which 2½ cents per pound bears to it.

During many years the English manufacturers have sought to extend and improve cotton planting in various countries. In promoting this object the Manchester Cotton Supply Association has been the chief, as it has been the most able and efficient, agency. Its thorough organization for gathering and transmitting information to and from all parts of the world prepared it for the emergency occasioned by our war, when it was necessary, by prompt diffusion of information, encouragement, seeds, machinery, &c., to avert the threatened exhaustion of the supply of this important material, and mitigate the evils of its scarcity.

All the energy and perseverance of this association, guided by wise counsels and unceasing experiments, supported by the wealth it could combine with the favor and assistance of the British government, had failed to achieve success in introducing the culture of cotton anywhere, or to extend it where previously existing, as in British India, so as to compete in any appreciable degree with the cotton product of the United States.

[1] In proof that this industry cannot bear this tax, it is only necessary to call attention to the samples of India cotton, which, when selling in Liverpool at 5*d*. per pound, returns to the ryot producer in India only 2*d*. Upon this price 2½ cents per pound is equal (at 135 for sterling) to 1*d*. or 50 per cent., and that advantage or premium is offered to the Indian producer by our tax system.

It has been demonstrated that no advantages of cheapness of labor elsewhere could counterbalance our advantages of soil and climate for cotton-growing, so long as we had labor well organized at low cost. We lost our position; it remains to be seen if we can regain it. Short as was the time, 1861 to 1865, it sufficed to work out wonderful results by the extraordinary power of price in forcing cotton-growing. Excessive production and supply must so reduce price as to lessen production and enlarge consumption. Shall the cotton product of the United States be reduced as in other countries? or shall our natural advantages be improved to restore this great industry to its proper pre-eminence? This, it is believed, depends almost entirely upon the legislation by Congress. Should an excise tax be continued, it is very evident that production in the United States, being unprofitable and burdened, must fall away until scarcity shall again cause high prices; whereas, without the tax, the southern people can successfully compete with the world, and more than recover the old monopoly of supply.

Having carefully observed what has been done and is doing by other nations, the Committee present the following conclusions:

1. That cotton-growing in our southern States, if untaxed, can be conducted profitably and successfully as against all competition elsewhere.

2. That if burdened by a tax sufficient to be worth to the treasury the cost of its collection, it cannot at present, if ever, be successfully prosecuted.

3. That, already familiar to our people in all its details, it is the only industry immediately available and practicable, to the great body of the laboring population of the south, for the profitable employment of surplus labor; that is, beyond the necessities of crops for subsistence, in the production of something salable and exchangeable, whereby wealth can be regained; and,

4. That the importance of a large production of cotton as the chief export of the country in adjusting balances of trade and exchanges, and especially in its bearing upon the future position of the public debt, so largely held and to be held abroad, cannot well be overstated, and so far transcends the value of the present tax, that to preserve the latter at the cost of losing the former would be a "ha'penny-worth of wisdom to a pound of folly."

In conclusion, the Committee desire to acknowledge their indebtedness to B. F. Nourse, esq., of Boston, for the very valuable statistics furnished by him, and which they have adopted, as coming from a source entitled to the highest consideration, his long acquaintance and connection with the cotton trade of the United States having given him unsurpassed opportunities for obtaining correct information.

Respectfully submitted.

E. R. MUDGE,
United States Commissioner, Paris Exposition.

PARIS, *August* 2, 1867.

List of cotton samples referred to in the report of the Committee.

South Pacific.—Feejee islands, Navigator islands, Polynesian islands, Raratonga islands, Friendly islands, Tahiti, (Society islands,) Oahu, (Sandwich Islands,) New Caledonia islands.

Australia.—Wooloomaloo, New South Wales, Sidney, New South Wales, South Australia, North Australia, West Australia, Wide Bay, Queensland.

Eastern Asia.—Java, (American seed,) Java, (native seed,) Philippine islands, Shanghai, Pegee, Rangoon, Siam.

British India.—Tenasserim, Assam, Indore, Palghaut, Dhullen, Broach, Oomrawuttee, Hinghenghat, San Ginned Dharwar, Dharwar, (New Orleans seed,) Comptah, Ferozepur, Chandah, Salem, Madras, (Bourbon seed,) Tinnevilly, (Madras,) Madras, Chwyleput, (New Orleans seed,) Berar, (Egyptian seed,) Nagpore, Delhi, Shorapore, (New Orleans seed,) Shorapore, Hyderabad, Khandeish, (Berar seed,) Khandeish, (Egyptian seed,) Khandeish, (Oomrawuttee,) Kurrachee, India, (New Orleans seed,) Ceylon.

Africa.—Soudan, Natal, Algoa Bay, (Cape of Good Hope,) Fort Beaufort, (Cape of Good Hope,) Kaffraria, Loanda, Cape Coast, Gold Coast, Bonny river, Onitsha, Fernando Po.

Indian Ocean.—Mauritius.

Asia.—Georgia, Circassia, Caucasus, Bagdad, Mosul, Kashan, (Persia,) Jaffa, Tarsus, Smyrna, Smyrna, (New Orleans seed,) Latakeea, (Syria.)

Eastern Europe.—Constantinople, Moldavia, Trebizond, Salonica, (New Orleans seed,) Thessaly, Volo, Volo, (New Orleans seed,) Serres, Mytilene, Aleppo, Enos, Larnica.

Southern Europe.—Laconia, (Greece,) Patras, (Sea Island seed,) Patras, (Egyptian seed,) Patras, (New Orleans seed,) Sassano, Italy, (Sea Island seed,) Terra di Otranto, (Siamese seed,) Marcerata, Italy, (New Orleans seed,) Catania, Sicily, (Nankeen,) Naples, (Sea Island seed,) Valencia, Malta.

Northern Africa.—Egypt, Egypt, (New Orleans seed,) Algiers, Bona, (Algiers,) Rabat, (Morocco,) Mazagan, (Morocco,) Madeira.

South America.—Lima, (Peru,) Paita, (Peru,) Callao, (Peru,) Taena, (Peru,) Bolivia, Paragnasu valley, (Bolivia,) Maranham, Maccio, Pernambuco, Soracoba, (Brazil,) Rio Grande do Sol, Ceara, Suo Paulo, (Brazil,) Ecuador, San Luis, Estardo, (Bolivia,) Berbice, Demerara, Venezuela, Costa Rica, Guatemala, New Granada, Paraguay, Rosario, (Argentine Confederation,) Buenos Ayres, Salto, Catamania, (Argentine Confederation,) Maracaibo, Salvador, Honduras, Yucatan, (Mexico.)

West Indies.—Jamaica, Cuban Vine, (Jamaica,) Jamaica, (Sea Island seed,) St. Kitts, Trinidad, St. Thomas, Tortola, St. Bartholomew, Dominica, Tobago, Porto Rico, Bahamas, Antigua, Turk's Island, St. Domingo.

United States of America.—Sea islands, New Orleans, Mobile, Uplands.

Also samples of 12 kinds of cotton seed.

SUPPLEMENTARY REPORT.

CHAPTER I.

THE PRESENT CONDITION OF THE COTTON CULTURE IN THE UNITED STATES.

REPEAL OF THE COTTON TAX AND ITS EFFECT—THE PLANTING IN 1868—ESTIMATED CROP OF 1868–'69 AND ITS CONSEQUENCES—DEFICIENCY IN THE COTTON SUPPLY—THE FUTURE PRODUCT—PAST ACCUMULATION—PRESENT AND FUTURE INCREASE OF WEALTH IN THE COTTON STATES—OPPORTUNITY FOR COTTON-SPINNING—WANT OF LABORERS—LARGE PLANTATIONS MUST GIVE PLACE TO SMALL COTTON FARMS—RESTORATION OF WORN-OUT SOILS—THE SOUTH CAROLINA PHOSPHATES—IMPROVEMENTS —SELECTION OF SEED, ETC.

THE CHANGE SINCE 1867.

Since the first part of this report was prepared, in the summer of 1867, nearly eighteen months have passed, which cover one of the most interesting and instructive periods in the history of the culture of cotton in America.

For a better comprehension of the important facts, and the lesson which they convey, it is well to recur briefly to some points set forth in that first report, which, having stated the unfavorable circumstances attending the cotton trade in the latter half of the year 1867, predicted a further decline in prices in Liverpool "to or below *7d.* per pound for *fair* Dhollera, (Surat,) and *9d.* per pound for *middling New Orleans*, which last would be equivalent to 20 cents in New York." It also stated that this price in New York "would return to the planter only 16 cents on the plantation," and that "if the price shall be only 16 cents in New York, or 12 cents to the planter, he cannot pay his hired laborers with the entire net proceeds." The event gave singular confirmation to the anticipations thus expressed. Under the depressing influences then in force, cotton declined in price until December, 1867, when *fair Dhollera* was sold in Liverpool at *5½d.*, and *middling New Orleans* was sold there at *7⅜d.*, and in New York at 16 cents per pound. The first half of the cotton crop of the United States for 1867–'68 was sold by the planters for less than its cost of production.

The crop of that year was much less in its yield per acre than the average of crops before the war. In the southwest it was reduced by spring overflows and other disasters, while labor was engaged at high prices for inefficient and irregular service in the greater part of the cotton-growing region. The relation of employer and employed had not

found its proper adjustment. Thus it happened that the second of the free-labor crops of cotton was deficient in yield for the area cultivated, and was a very costly one to the producer; yet, up to the middle of January, 1868, it was selling, as above stated, for less than the average cost of its production. Then it was subject to the internal revenue tax of 2½ cents per pound; a burden too great to be borne, when cotton was selling at 10 to 13 cents, tax paid.

The production of a good crop of cotton requires the effectual preparation of the land during the fall and winter by cleaning, fencing, ploughing, &c. The beginning of this work may not be deferred beyond January; yet, just then everything seemed to conspire together for the discouragement of cotton-planting in our country, and to prevent the needful preparation even for one more crop. No other available productive industry offered itself instead, and there was a widespread gloom, almost despondency, throughout the south, aggravating the discomforts of the poorer people, white and black, who in many districts lacked sufficient food and clothing.

REPEAL OF THE COTTON TAX AND ITS EFFECT.

It was at this juncture that Congress repealed the cotton tax. The expediency and necessity of that legislation had been stated by this committee in the first part of their report, and they find eminent satisfaction in presenting now a statement of its immediate effects in the development of prosperity and comfort within the cotton-growing States exceeding the most sanguine expectations.

It was the turning point. The mistake of continuing that tax would have been potent for evil and forbidding the hope of improvement, while the act for its repeal was charged with blessings and benefits, operative now and for all time, for the people of the south, indeed, but scarcely more than for the people of all other sections of the common country.

It made sure to the former the restoration of their monopoly of the cotton supply of the world, and opened the way to a rapid improvement in their condition, by the increase of wealth and development of industrial power and resources beyond precedent, if the opportunities shall be reasonably improved.

It had been argued that the repeal of the tax, as encouraging the culture of cotton, would further depress its price in the market.

It proved otherwise. The price was adjusted in the relations of the existing supply and demand. Almost coincident in time with the act of repeal, cotton began to improve in market value. This occurred early in January, and before the end of April *middling New Orleans* cotton was worth 33 cents in New York and 13½*d.* in Liverpool, an advance from December of nearly 100 per cent.

THE PLANTING IN 1868.

Meanwhile the preparation for planting was going on under the renewed encouragements given by these changes of law and of market.

Before the war, the general custom of planters was to obtain from their factors or bankers, usually the former, an advance of money, enough to obtain the year's supplies and cover the probable expenses of making the crop, to be repaid upon sale of the cotton.

The destruction of property and the losses by the war in the south had impoverished the people, and disabled, to a great extent, the whole body of planters. Two years of experiment in planting under a new system of labor, and mainly upon money borrowed under pledge of the crop or plantation, or both, had resulted in the exhaustion of credit as well as capital. Planters without money; factors and bankers unable or unwilling any longer to supply it; and laborers needing employment to obtain supplies of the necessaries of life: such was the position in January when work began for planting the crop of 1868–'69.

One other material fact, bearing upon the position of American cotton-planting as it stood in January, 1868, should be mentioned here.

The adversities of the two years preceding had fallen upon both planters and hired laborers, and had not been without their uses. The freedmen had learned that liberty did not carry the right to be idle or unfaithful, and that the coveted citizenship had its duties as well as its privileges; while the planters had been learning that the almost universal opinion expressed in the phrase "the negro will not work" (as a freeman) was a mistake, and that it was practicable to make a cotton crop with free labor if only the proper understanding could be established. Interference had in a good degree ceased, and the two parties specially interested came together under a common interest, which to one, if not both, was as imperative as necessity. Here was the beginning of the practical recognition of the true relations of labor and capital, which only need to be fully and intelligently applied throughout the south, among both races, and guided by an enlightened sense of public and private justice, to secure to the southern States the full benefit of the superior climate, soil, and mineral and other resources with which they have been endowed by nature. These, rightly used, will bring increase of population, wealth, education, refinement; and these again will develop a strength and power impossible under the system which was displaced for this better one, the first fruits of which are now to be considered.

The sanguine hopes which attended the planting of 1866 and 1867 were all gone when the work of preparation became necessary in January 1868. There was the one encouragement given by the act of Congress, that whatever cotton should be produced after 1867 would be exempt from all direct tax. Planters could not repeat the offers of high wages current in the previous two years. Yet the lesser wages and shares of crop which they did offer were more readily accepted and better earned by their hired people than the greater wages of those previous years. As the planting progressed, the remark came from all quarters: "The freedmen are working well."

It is to be assumed that the area of land put under preparation for cotton under the discouraging circumstances which have been described, was less than would have been planted by the same persons under more favorable conditions, and far less than the labor of the country was capable of working well. However, the price of cotton continued to advance up to May, and doubtless the better promise of the future value thus given co-operated with the increased strength derived from the higher prices at which the last third of the crop of 1867-'68 was sold to extend the planting to a late period in the spring.

Late planted cotton is exposed to injuries from caterpillar, early frost, &c., which are escaped by the early planted portion by reason of its more mature condition. In the States east of the Alabama river the season has been unfavorable compared with that of 1867, and the crop promises to fall short of the crop of that year by 20 per cent. In the southwest, on the contrary, the season has been more propitious, and the promise is of a material increase upon the preceding crop.

THE ESTIMATED CROP 1868-'69—ITS CONSEQUENCES.

The total culture of cotton from the planting of 1868 (crop of 1868-'69) is estimated at 2,300,000 to 2,700,000 bales. Taken at the mean, say 2,500,000 bales, and at the average value in southern markets now, January 1, 1869, the crop is worth \$270,000,000, and the people of the States producing it can sell from it to the value of more than \$260,000,000, after supplying their own wants, (say 90,000 bales.) Further, appropriate for use in the northern and western States, 950,000 bales, worth \$100,000,000, making a total of 1,040,000 bales retained for home use, and there would remain for export to foreign countries 1,450,000 bales, of currency value exceeding \$155,000,000, sufficient to supply, at gold rates, about \$115,000,000 value in foreign exchange. If to this extraordinary result be added the value of the sugar, rice, tobacco, hides, wool, naval stores and other saleable productions of the cotton-growing States, besides food crops more than enough for subsistence, and the whole be considered as the product of the industry of a people so enfeebled, poor, and disheartened only a twelve month ago, it seems marvellous indeed. And this result has been achieved by the agricultural people of the south relying upon their own resources, and incurring very little debt outside the plantation.

The agricultural interest of the south has won its independence. It matters not how the proceeds of all these crops shall be divided between the landholder and the laborer, (except as to the wisdom of future use,) so that there shall be this actual addition of wealth or buying power that is represented in the value of productions sold above the amount paid for articles consumed. This excess is profit, and this profit is hereafter to be reckoned by hundreds of millions of dollars annually.

THE FUTURE PRODUCTION OF COTTON.

PRESENT DEFICIENCY IN COTTON SUPPLIES.

The fact stands clearly demonstrated that the supply of cotton is not equal to the wants of the world. During the year ending September 30, 1868, the consumption of cotton in Europe and America exceeded the supplies brought in by about 500,000 bales, which was made good by drawing down to that extent the stocks with which the year began. This apparent deficiency would have been reduced 100,000 to 200,000 bales if the Indian crop had come forward as early as usual. Yet the fact of insufficient supply remains. Nor can the probable supply of the year ending September 30, 1869, be enough to prevent a similar, though, perhaps, smaller demand upon the already reduced reserves, if consumption shall go on at the rate of the year past. The reserves, or stocks in mills and markets with which the year began, (October 1, 1868,) were too small to bear another such draft upon them as was made by the deficiency of last year.

It follows that consumption must be checked, and probably by the force of high prices resulting from the competition to secure the larger and better portion of the cotton in market.

The American crop of 1868–'69 is moving off at the high prices thus secured. The circumstances attending the planting of the crop of 1869–'70 are in many respects quite the opposite of those of last year.

There is every inducement to plant as much cotton as possible, and money is abundant from the proceeds of the crop now selling. Should the season be favorable, a considerable increase upon the yield of 1868 is to be expected. The check to be given to the consumption of cotton by its scarcity and high price this season, must reduce the supply of cotton fabrics in market, and thus induce a larger demand in the ensuing season. It may well be that, under the present very high prices, the production of cotton in all the world during the present year will overrun the consumption for a time; if so, a fall of prices will soon enlarge the latter, because cheap goods extend the markets for them. Of the present crop only about 1,250,000 bales (1,000,000 of the receipts at ports, and 250,000 bales by inland routes to the mills) have been sold by the growers, (January 1, 1869;) and it is already announced that they hold the remainder free of debt, and are seeking investments for their money. In proof of this, attention has been called to the recent considerable advance in the value of the shares in all the active and dividend-paying railroads, manufactories, and banks. One of the leading cotton brokers of New York, in his circular for Europe, after noticing the facts above referred to, says: "We believe, also, that hereafter planters will market their own crops, early or late, as may appear to them most advantageous for their own interest. Their ability to do so is much greater now than before the war. Manchester spinners will do well to make a note of this."

THE PLANTING FOR THE CROP OF 1869-'70 AND THE FUTURE.

Inducements to large planting will open employment to every person able and willing to work, and may renew a hurtful competition for labor, leading to excessive wages. All this, however, must be left to adjust itself under the operation of demand and supply, and further results will complete the imperfect demonstration of the past year, that cotton-growing by labor left free to assert its own price, and not burdened by unwise imposts, is cheaper and more profitable to the individual planter than planting by slave labor could be under its most favorable circumstances, while the community will gain in wealth, and the best uses of wealth beyond anything conceived by men of the past generations. Other countries producing cotton will also enlarge their several contributions towards the commercial supply under these high prices and demand.

At some time, probably not distant, production so stimulated will outrun consumption, and leave a surplus beyond the want of the year large enough to depress prices extremely. Following the natural law, this must lead to a larger consumption and a reduced production.

Cotton culture will be most reduced, or cease altogether, in those countries where it has been introduced or sustained only by "war prices," and will be continued, or even increased, where most favored by natural advantages. In that competition our country has everything in its favor. The strength now accumulating will sustain our cotton production through the period of depression, and show its practical monopoly re-established for supplying cotton adequate to the wants of the commercial world. It may be, again, that prices, which will be fairly remunerative here, will be too low to sustain the cotton culture of less favored countries in comparison with other pursuits.

It was written of the southern States in 1861:[1] "The present capacity of labor applicable to cotton-growing and the land now open are equal to the annual production of 5,000,000 bales. Of the *rich* lands within the borders of the cotton States, not one-fourth have yet been cultivated. They can be made to yield any supply of cotton that the consumption of the world shall demand, up to 20,000,000 bales, of 500 pounds each, annually. Nor will labor be wanting adequate to any progressive increase of demand for cotton. Five years ago it was held to be impossible to obtain labor to handle and pick a crop of 4,000,000 bales, yet last year a crop of 4,675,000 bales was prepared and marketed. Labor is now more effective than it was twenty years ago. * * * Such are the improvements, relieving human with brute labor, substituting the *mule and plough* for the *man and hoe* in field work, and in better implements and processes, that the produce of one man's labor is nearly equal to that of three men twenty years ago; his labor is more easily performed, and the planter feeds, clothes, and insures but one instead of three.

[1] By the writer of this report.

The crop in the field is more even in growth and in the opening of the bolls, so that each hand can pick much more in a given time than formerly. The produce per acre has increased everywhere—in the fertile lands of Mississippi, and in the worn lands of Georgia and the Carolinas; the latter by use of fertilizers and more thorough working of the land. Nor has improvement ceased. It will continue as well in the manual operations and application of better husbandry and more fertilizers to the soil as in more skill and more intelligence in the laborers of each successive generation, and all more systematized. * * * This being the position of cotton-planting in the United States, having all the conditions necessary to success—climate, cheap labor, ready access to market, and ability to sustain itself at six cents per pound—what part of the world can offer to compete with them?

"Suppose a succession of unfavorable seasons, or other contingency, shall cut down the American supply, and prices so advanced as to encourage cotton-planting in various other quarters; these, aided by high prices, prosper a few years and contribute sensibly in aid of the supply from India and the United States. The latter, also enjoying the high prices, extend the culture; good seasons ensue; they make large crops—5,000,000 or 6,000,000 bales. Suddenly the world is overstocked—has on hand a stock for a year or two in advance. Inevitably, prices would fall to a range ruinously low—not enough to pay the cost of preparation for market and freights from distant points. The United States planters would still go on and wait for a turn of prices in their favor. But the planting elsewhere would die out as it has before, except where sustained by a local market, as in India and China."

True as was the statement of our superior natural advantages for cotton-growing in 1861, it is in a higher degree true now, with this remarkable difference: that in passing that "other contingency," which "cut down the American supply and advanced prices so as to encourage cotton-planting in various other quarters," another and cheaper labor system has been substituted.

PAST ACCUMULATION OF WEALTH FROM THE PRODUCTION OF COTTON.

During the ten years 1851–1860, the crops produced in the cotton-growing States, (cotton, sugar, tobacco, rice, &c.,) not consumed at home, left a surplus of proceeds from sales amounting to about $1,200,000,000, an average of $120,000,000 per year, which, less the amount required to be expended beyond their borders for the comforts or luxuries of life, should have been so much added to the reproductive capital within those States. If one-half only was thus required, the other half, or $60,000,000 per year, should have been put to profitable use.

Throughout the southern States some internal improvement was in progress, chiefly in the form of railroads. In some States, as in Georgia, these works had been largely extended. Cheaply built and economically operated, they generally proved to be profitable investments, capa-

ble of rapidly repaying the loans incurred for their construction, which in many cases covered a great part of the cost.

A large amount of banking capital was well employed, but this, when not owned abróad, was chiefly the product of the commissions and other charges upon the produce of the country, and not to any considerable extent drawn from the accumulating capital of planters.

The capital which had built the few cotton and other factories and the machine shops had also accrued chiefly from charges upon the productions of the country. What, then, was done with the \$60,000,000, or whatever other sum represented the true annual gains of agriculture in these States? The statistics of population show pretty clearly that a great part of it was expended in importing slaves from other States.[1]

PRESENT AND FUTURE INCREASE OF WEALTH IN THE COTTON STATES.

When considering this subject in its economical aspect only, special effects bearing upon individuals or classes are to be disregarded for the general results affecting the whole community.

Population is wealth. Money sent from Alabama to Virginia to increase the laboring power of Alabama, even by importing slaves at \$2,000 each, added in some degree to the wealth of that State. But if laborers of equal productive power could have been introduced without expending anything for them, the capital expended in the other case would have been saved, and the community would have gained its use in some other form of productive power, as in tools, machinery, or animal labor, with which to supplement and increase the value of manuál labor. To the whole people, or the State, that is just the difference, in the *investment*, between importing a slave and importing a free laborer of equal capacity. There are other differences to the State, scarcely less important in an economical view, all in favor of the free laborer. Whatever the cotton-producing States expended for slaves above the cost of importing an equal amount of free-labor power was twice lost to the community.[2]

Reckoning the slaves in the cotton States prior to 1861 at 3,000,000 in number, of the average nominal value of \$500, equal to 1,000,000 full hands, at \$1,500 each, we had an investment of \$1,500,000,000; and to replenish this force a large sum, much needed for other uses, was annually drawn from the gains of those States.

If, in 1860, the people, by unanimous consent, had declared the emancipation of all those slaves, whether with or without compensation to those who had owned their service, there would have been neither loss nor gain to the community, except as the change might increase or diminish the efficiency of labor or the cost of its maintenance. There would have been no "annihilation of property," for the whole labor

[1] See Atkinson's "Cheap Cotton by Free Labor," page 30, and DeBow's Analysis of the Census of 1850, quoted in the former.

[2] See Appendix A, capital invested in the cotton culture.

power would have remained as before, only it would have changed owners.

Precisely so stands the effect of the decree of emancipation, made as an act of war, with this difference, however, that the laborers of both races were sadly reduced and demoralized by the incidents of the war which wrought the change. The same laboring force still exists, with the exception mentioned, and except, also, that the sudden and violent change in relations between capital and labor render further time and experience necessary to make it fully effective.

While it is indisputably true that free labor is always cheaper than slave labor, when each is under its most favorable conditions, the demonstration of that truth needs more favorable circumstances than were found in the years 1866, 1867. The prejudices of those who must use it were arrayed against it. Scarcity of food and of other necessaries of life followed an exhausting war. The sufferings of the very poor of both races were alleviated by government rations and by private beneficence; but planters were compelled to supply all the wants of themselves and their laborers, while breadstuffs were at very high prices, and implements, farming animals, and their subsistence were equally scarce and dear. At first the freedmen were not disposed to work for hire—demanded excessive wages, and after accepting them, too often rendered poor service. The crops of both cotton and grain failed, more or less, in both those years throughout the south. In some cases there was failure to fulfil contracts on the part of the employer, from disability or other causes, while the "shares of the crop," which had been accepted by the freedmen as wholly or in part in lieu of wages, too often resulted in "nothing but loss," leaving the freedmen destitute and the planter in a condition not much better.

It was not until 1868, the third season of the free-labor experiment, that it became generally successful in its operation and results. Then improvement appeared, and the harvest, abundantly supplying the people with cheap food, leaves a surplus stored up for the future. The profit arising from the sale of the exportable productions of the same season will amount to $250,000,000; and a reasonable forecast of the future sees a promise of equal gain in some of the succeeding years, the increase of quantity compensating for any reduction of price.

The annual gain, be it $50,000,000 or $250,000,000, is no longer to be wasted in the purchase of labor, when as good, or better, will be obtained without purchase; yet the capital must be employed and will seek investment. For some years very little will be needed in opening fresh lands, of which there is already too much open for the labor applicable to it. After meeting the demands of agriculture it will seek other profitable uses, as in banking, railroads, manufactures, machine-shops, and the other active employments which capital finds for itself. Prominent among the improvements, that of reconstructing the levees and reclaiming the most fertile of cotton and cane lands should be one of the first,

and, rightly conducted, one of the most profitable for the employment of money.

OPPORTUNITY FOR COTTON SPINNING.

Proximity to cotton fields abundance of water power and of building materials in healthy localities, as well as of fuel, both wood and coal, and cheap labor, not suitable for the field, begging employment, all indicate the advantages and certainty of rapidly extending works for the manufacture of cotton in the cotton-growing States, especially for the spinning and export of coarse yarns.[1]

WANT OF LABORERS.

Now that capital is returning into the cotton States, the great want there will be labor, a better use of what they have and more of it, to extend their profitable agricultural business, yet carry forward the other works which will be required. So far, the prevailing conditions in the south have not been attractive to immigrants. Poor crops, dear food, destitution of the common laborer, and these evils too often aggravated by disorder and violence, were reported during the years 1866 and 1867.

The prosperity of 1868 stands in marked contrast to the adversities of the two years preceding. A similar prosperity repeated in succeeding years until it shall be regarded as the rule and not the exception, supported by assurance of peace and safety, will turn the tide of emigration freely from the northern States and from Europe to the cotton-growing States. During the present year the Pacific railroad will be completed and opened, a highway by which the Chinese and other coolies or Asiatic laborers may reach the cotton fields of the United States. They are industrious, frugal, quiet, and numerous.

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[1] The publications of the National Association of Cotton Manufacturers and Planters contain some correspondence, from which we select the following statement from South Carolina. (See appendix B for an account of the Augusta factory.)

"Mr. L. D. Child, of Columbia, S. C., presents the following statement of the advantages which that section of the country offers to cotton manufacturers:

"'1. *Climate.*—Requiring but little fuel. Fires necessary only two or three months in the year. Good resinous-heart pine wood, cut and corded within one mile of the factory, can be procured at only one dollar per cord. Our total cost for fuel for, say, three months in the year, is less than one-te th of a cent per pound on manufactures of those months.

"'2. *Wages.*—Land is cheap and we are enabled to give each family of operatives a very large garden—large enough to enable them to raise their year's supply of vegetables. Wages are consequently low.

"'3. *Operatives.*—The supply is far greater than the demand. They are frugal and industrious. Girls are white. Some few of the men are black.

"'4. *Freights.*—We save the freight on bagging and rope and waste, an important item, as we can sell our waste to local paper mills at nearly, if not quite, northern rates. In the summer of 1867, freight on one bale of cotton, worth, say, \$80, from Charleston to New York, was from \$2 to \$2 50. On yarn, worth, say, \$1 20 per bale, only 60 cents, a difference of about 2½ per cent. on the value

"'5. *Cotton.*—We purchase of the producer or his agent. The commissions, brokerage, and other charges paid by northern mills are therefore avoided. Reclamation easy and direct.'"

The people of the south, who are to be the immediate beneficiaries of rapidly increasing wealth, will become large consumers of the productions of other States and other countries, and in that capacity will contribute scarcely less than as producers to the general welfare, the extension of trade, and the payment of the national debt.

LARGE PLANTATIONS MUST GIVE PLACE TO SMALL COTTON FARMS.

It seems to be conceded in the south that the large plantation system must generally be abandoned, in the culture of cotton, for smaller holdings of land more thoroughly worked under the direction of the proprietors. This will favor a more general industry, more numerous proprietary interests requiring personal care, better economies, and a constantly improving agriculture, which will preserve the fresh lands in good fertility and restore those which have been over-cropped.

In cotton growing as in market gardening, or any other tillage of the soil, it pays better to keep a small body of land (just enough for a full and fair use of the labor that can be applied to it) under high culture by thorough working and the use of fertilizers, than to half cultivate a larger area with the same or any adequate force.

Since the war, experiments made to ascertain how much cotton can be produced upon a single acre, have exhibited remarkable and gratifying results. When made with "spade culture," stirring the soil deeply and often, after enriching it with guano and phosphates, the product has been very large. In one case, reported upon what seems to be good authority, the product of one acre was *four bales*, or over 1,600 pounds of clean cotton. In past times one bale to the acre has been regarded as a fair crop, and two bales a very large one on the very richest lands, while half a bale, or about 250 pounds, was for many years a satisfactory result in Georgia and the Carolinas, where the lands were badly worn. The story of 1,600 pounds seems almost incredible,[1] yet it is no more in excess of ordinary products than were some remarkable root crops—rutabagas and mangel wurtzels—that have been obtained by the same process of spade culture. Improvement by better farming, to get more cotton from less land, is practicable, and should be sought as the method of true economy, saving in labor, in manure, and all other outlay, yet increasing the income.

RESTORATION OF WORN SOILS—MINERAL AND ORGANIC MANURES.

The value of the calcareous and phosphatic marls, found in various parts of the country, for fertilizing and renovating impoverished soils, has long been known. They were freely used in the older portion of the cotton-growing States with beneficial effects. During the few years

[1] "Mr. D—— has eyes to observe, and reports exactly what he sees. He tells me that he knows several instances where double the usual crops have been made on small patches, and one case where a man raised four bales of cotton on one acre of ground, the whole acre cultivated by hand, no mule needed, nor ass either."—*Extract from letter.*

prior to 1861 some importations were made at the south of various commercial fertilizers, guanos, ground bones, and certain nitrates, phosphates, and superphosphates, some very good and some having very little value. The importation and use of these artificial manures had been greatly extended just before the war. The really valuable among them, such as the true guanos and superphosphates, had a marked effect in the increase and better quality of the cotton produced, and this was as apparent on the light and much worn lands of the Carolinas and Georgia as upon the heavier and fresher lands further west.

THE SOUTH CAROLINA PHOSPHATES.

Since the war, a discovery of exceeding value to the agriculture of the whole country, and especially to the cotton culture, has been made in the "native bone phosphate," vast beds of which have been found lying all along the coast of South Carolina and on the Sea Islands; but cropping out and most easily accessible along the banks of the Ashley and Cooper rivers. Richer in these phosphates than any other natural deposits yet discovered, these beds lie just beneath the supersoil, at the very doorway into the cotton-growing country. A description of them and of the circumstances leading to their discovery will be found in the Appendix C, in a letter from Dr. N. A. Pratt, whose researches, aided by others, have opened up a treasure whose value cannot now be measured.

This store of phosphates, thus prepared in nature's laboratory and laid up until the day of special need, contains just the chemical properties wanted for the cotton plant, and which the cotton seed had been abstracting from the soil. So long as cotton seed was returned to the soil upon which it was grown the deterioration of the land was slow, for the fibre of cotton took but little from it.[1] But cotton seed had acquired a commercial value for the oil to be expressed from it, and for the rich food for cattle and sheep, which was found in the "cake" from which the oil

[1] S. L. Goodale, esq., secretary of the board of agriculture in Maine, a writer upon agricultural chemistry, writes thus: "I can conceive of no reason why cotton culture should not be less exhaustive than that of any other agricultural crop with which I am acquainted. Look at it; the product desired is merely cellulose or woody fibre. In this form it possesses a market value of, we will say, $100 per acre, but to return to the soil it is of no more manurial value than so much saw-dust or wood in any other form, consequently it may be exported with impunity. Besides this there is a side product of seed which draws heavily upon the soil; but this may be utilized and all of value to the soil be returned to it. The seed may be decorticated, and the oil expressed and sold with no loss of ash constituents from the soil. The cake remaining possesses both feeding and manurial value in a high degree. Ground to meal and fed in connection with corn-fodder and annual grasses, (if no more permanent grasses can be grown with improved management,) it can be converted into meat and manure, and thus fertility be fully maintained or even increased.

"Phosphatic and alkaline constituents exist in decorticated cotton seed in large proportion. Its ash is abundant, being not less than 7½ or 8 parts in 100, and of this ash 39 per cent. is phosphoric acid, chiefly in combination with potassa, a little with magnesia, and a very little with lime. Thus a ton of cotton seed cake—that is, of seed with the hulls taken off and the oil pressed out contains about 60 pounds of phosphoric acid, which in a soluble form, as

had been expressed. It could no longer be carted back upon the land as a manure. The land, already worn by many years of improvident cropping, having this further loss, rapidly failed. Some portion of the needed restoring and fertilizing remedies could have been found in the artificial superphosphates and guanos of commerce, but these had become almost inaccessible. Often badly adulterated, and year by year advancing in price as the demand outran the supply of the good articles, while many of the planting people had become unable to buy them, except in very insufficient quantities, there was a great and urgent need of something to replace the cotton seed, and restore to the soil those chief ingredients, indispensable to the production of a good cotton crop—phosphoric acid, or soluble phosphates. In this emergency came the discovery of those natural deposits.

Already too much space has been given to the effort to report faithfully the condition of the cotton culture of the United States, at the close of the year 1868; especially to exhibit the wonderful change from its condition one year previous, and from all the circumstances to draw a fair statement of the promise of the future for this great interest.

OTHER IMPROVEMENTS—SELECTION OF SEED, ETC.

It might be useful, did space permit, to notice in detail other movements in progress for the improvement of cotton culture, prominent among which would stand the valuable experiments in "improvement by selection of seed" from year to year, always guided by rules which define the object sought—in cotton, spinning qualities, such as length, strength, fineness, and the cohering together of the fibres; rapid growth and early maturity of the plant, and a habit of yielding well. Intelligent men are engaged in these efforts in various parts of the south, and of their results attained there are good reports from Georgia, Mississippi, and Arkansas. One new kind of cotton, the "Peeler," originating in Mississippi, is already in market, and bears a price 25 or 30 per cent. higher than other green seed cotton of the same grade, because of its superior staple.

phosphate of potash, and with its combined alkali, cannot be deemed worth less than 10 cents per pound—I think it should be rated higher, but, say........................ $6 00

"The same cake contains $6\frac{1}{2}$ per cent. of nitrogen, say 130 pounds to the ton, and this, rating it at what is paid for it in Peruvian guano, say 17 cents per pound, amounts to........................ 22 10

"So we have as the manurial value of one ton of decorticated cotton seed cake, at least........................ 28 10

"It is well to bear in mind that the larger part of this (when the cake is fed to stock) would pass away in the liquid excreta, and unless the urine was absorbed or somehow saved, nothing like this value would be realized. In the light of these facts it is easy to see how wide a difference may be occasioned by the loss of the seed on the one hand and its use on the other."

CHAPTER II.

SKETCH OF THE HISTORY OF THE CULTURE OF COTTON IN THE UNITED STATES AND OTHER COUNTRIES.

Introductory—United States—First Cotton Planting—Prominent Incidents in Colonial Times—Invention of Cotton Spinning Machinery—First Exports—Whitney's Cotton Gin—Comparative Progress of Cotton Consumption—Sea Island Cotton—Statistics of Cotton Production—British India—Egypt—Brazil—West Indies and Guiana—Turkey—Other Countries.

Cotton, the great commercial staple of modern times, was a native plant in Asia and America, and probably in Africa.

Herodotus (450 B. C.) describes the clothing of the people of India as made of cotton, "the fruit of trees grown like wool but finer than the wool of sheep," the earliest mention of cotton that can be found except perhaps in the ancient Hindoo writings.

Cotton cloth, as worn in India and Persia, was mentioned by Strabo (A. D. 45) and fifty years later. Pliny wrote of the use of cotton in upper Egypt towards Arabia and near the Persian gulf.[1]

In the first or second century of the Christian era cotton and its fabrics were first mentioned as articles of trade, when Arab traders brought India cottons to the Red sea.

The culture and manufacture of cotton were introduced into Europe as early as the tenth century through Spain by the Moors, who used it very extensively and made fine cloths from it.

It is said that the plant was brought into Italy and cultivated in the fourteenth century when cotton was used to some extent in the place of silk and flax, and about the sixteenth century raw cotton was taken to the Low countries, Great Britain and other parts of Europe, as a material for textile manufactures.

Its early use in Europe was chiefly in the manufacture of *fustians* and *dimities* or mixed with flax, a cotton weft with a linen warp, and in all forms the consumption of cotton was of small amount until the eighteenth century.

It was not until machinery was invented for the manufacture of cotton that its fabrics could be produced possessing goodness of quality and cheapness combined sufficient to displace the fabrics of linen and of wool.

Upon the discovery of America, cotton was found among the native productions of the West India islands, Mexico and Central and South

[1] Quoted from Baine's History of Cotton Manufacture.

America, where the arts of spinning and weaving it were known to the aborigines, who made "beautiful cloths," some of which was dyed with colors "extremely fine." But in the territory, afterwards that part of our republic known as the "cotton-growing States," whence, previous to 1861, the commercial world derived nearly all of its grand supply of raw cotton, the cotton plant was unknown until A. D. 1621.

UNITED STATES.

FIRST COTTON-PLANTING IN THE UNITED STATES.

Bancroft, writing of Wyatt's administration in Virginia, says: "The first culture of cotton in the United States deserved commemoration. This year (1621) the seeds were planted as an experiment, and their 'plentiful coming up' was, at that early day, a subject of interest in America and England."

"A Declaration of the State of Virginia," a tract published in London, 1620,[1] quaintly says: "Wee rest in great assurance that this countrey, [Virginia,] as it is seated neere the midst of the world,[2] between the extreamities of heate and cold; so it also participateth of the benefits of bothe, and is capable (being assisted with skill and industry) of the richest commodities of most parts of the earth." The same tract mentions *cotton wool* and sugar-canes in its enumeration of the "naturall commodities dispersed vp and downe the diuers parts of the world, * * * all of which may there [in Virginia] also be had in abundance with an infinity of othermore."

The cotton thus early introduced, by seed probably from the Levant or the West Indies, no doubt improved in the more favorable climate and fertile soil of this country, as all varieties of the *annual* cotton plant have improved upon their original quality, when cultivated here, wherever may have been their origin. Yet its cultivation was for a long time limited to gardens or small patches for domestic use. It was distributed northwardly, for we find traces of its culture afterwards in Maryland, Delaware, Pennsylvania, and even in New Jersey, down to the period of the revolutionary war, when it is recorded, the home-grown cotton near Pennsylvania was sufficient for their domestic wants. Then, however, the people were clad chiefly with linen and woollen fabrics, and very little cotton was required. A list of articles "growing or to be had in the [Virginia] collony" in 1621 and giving the valuation of each, includes *cotton wool*, *8d.* per pound, and flax at about *3d.* or 26 shillings per cwt.

Although the experiment of cotton-planting in Virginia was successful, it was not followed by an increased culture beyond domestic wants. Explanation is found in the greater profit of tobacco-growing in that colony where labor was scarce and dear, so that the cost of hand-clean-

[1] Force's Collection, vol. 3, p. 4.

[2] Virginia seems to have a prior title to the position claimed for Boston by *The Autocrat.*

ing, or separation of the seed by hand, before a gin had been invented, exceeded the commercial value of the cotton so cleaned.

PROMINENT INCIDENTS IN COLONIAL TIMES.

To encourage ship-building and textile manufactures at the same time, the general court of Connecticut, in 1640, ordered "that a trade in cotton wooll be set upon and attempted." A vessel was built and sent upon her voyage; and later, the several towns were required to take each its share of the *cotton wool* so imported, the share of Hartford being £200 worth.

In 1641, the general court of Massachusetts, in apprehension of a scarcity of clothing for the ensuing winter, offered premiums for linen, and, as a present means of supply, "till *cotton* may bee had," directed the use of wild hemp.

In 1708–'15, the importation of cotton was continued in small quantities by the northern colonies, chiefly from Barbadoes, but some also from Smyrna and other places where trade extended.

The cultivation of cotton was early introduced also into the Carolinas and Georgia, and into the French colony of Louisiana; yet a half century elapsed before its culture was so extended as to find mention as an article of importance in the chronicles of the day, and then after many importations of seed from various countries and renewed attempts to extend the cultivation.

Cotton seed was brought into Carolina by Mr. Peter Purry, who settled a colony of Swiss near Purrysburg in 1733, and who, in his description of Carolina in 1731, says: "Flax and cotton thrive admirably," from which it is evident that some kind of cotton had preceded his own planting.

About the same date (1734) it was planted in Georgia from seed sent to the trustees by Philip Miller, of Chelsea, England. In the collection of the Georgia Historical Society we find mention of cotton several times in the early papers concerning that colony. In "A new and accurate account of the provinces of South Carolina and Georgia," a tract ascribed to General Oglethorpe, London, 1733, and in "A Voyage to Georgia, began in the year 1735," by Francis Moore, London, 1744, cotton was mentioned as having been introduced; and in 1741[1] a sample of Georgia cotton was taken to England. The deposition of Samuel Anspourguer, a Swiss who had been living in Georgia, was taken for the use of the trustees of the Georgia grant, in London, 1739, in the controversy about the introduction of slaves, which had been disapproved by Oglethorpe and some others of the company, and opposed by the *Highlanders* (Scotch) and *Saltzburgers*, who had been settled in Georgia. This deponent said,[2] "that the climate of Georgia is very healthy; * * * that the climate and soil is very fit for raising silk, wine and *cotton;* * * and

[1] Collection of Georgia Historical Society, I, 164.
[2] Collection of Georgia Historical Society, I, 191.

that the cotton, by this deponent's own experience, who has planted the same there, grows very well in Georgia. A specimen of this cotton this deponent brought over with him and produced before the trustees. All which produces, this deponent saith, can be raised by white persons without the use of negroes."

In Louisiana, in the year 1742, M. Dubreuil, a French planter of skill and enterprise, invented a machine for separating the seed from the fibre. It is to be inferred that the culture of this plant had become somewhat extensive to call thus early for such a machine. It greatly stimulated the cotton culture in that colony, imperfect as it was; probably only an adjustment of rollers, like another contrivance by Crebs, of Florida, in 1772, which was the best machine for cleaning cotton until the invention of the saw-gin by Whitney.

Previous to these primitive instruments cotton fibre was detached from the seed by the tedious process of picking with the fingers, the evening task of many members of the household in the early days of cotton growing. The bow-string, in its use, intermediate between the fingers and the primitive gins, and used for beating up as well as cleaning the cotton, was borrowed from India, where it was used in ancient times; and having been first introduced into Georgia, gave occasion for the term "bowed Georgia," as still applied to cotton in Liverpool, with British persistency, although not a pound of *bowed* Georgia cotton has been in that market for fifty years.

The practiced skill of the people of India had wrought works of marvellous fineness and delicacy for many ages, spinning their Bunga cotton more finely by hand than any machinery has ever equalled, until very recently, and then from the finest Sea Island fibre. But the use of cotton in Europe and America was recent, it had increased but slowly, and the product was neither fine nor cheap enough to compete with linen and woollen goods for common wear.

The annual value of the cotton manufactures of Great Britain, in 1767, was estimated at £600,000,[1] and then the goods were a compound of linen *warp* and cotton *weft*.

INVENTION OF COTTON SPINNING MACHINERY.

In 1767 Hargreaves invented his "spinning jenny." In 1769 Arkwright obtained his first patent for a "spinning frame," though his second patent for the complete machine was not taken out until 1775. About 1770 James Watt obtained his patent for the steam-engine, which was applied to machinery in cotton mills in 1785. Thereafter the cotton manufactures of Great Britain went forward with rapid increase and general prosperity. Just when these discoveries in Great Britain called for larger supplies of raw cotton, the inventive genius of Whitney gave to the cotton culture in America the *saw-gin*, which was to be a benefit and

[1] Baine's History of Manufactures, p. 218. Other authority had stated the amount at £200,000 only.

source of power corresponding here to the great discoveries in mechanism which had just preceded it in England. Cheap cotton and cheap cloth were thenceforward to be supplied to all the world.

THE FIRST EXPORTS OF COTTON GROWN IN THE UNITED STATES.

There are some interesting points in the history of American cotton culture in the latter half of the eighteenth century worth noting here, if only as a chronological statement of them, down to the time when the magnitude of the cotton production and trade secured for them regular annual statistics.

During the year 1747, several bags of cotton, valued at £3 11*s.* 5*d.* per bag, were exported from Charleston. Some American writers have expressed a doubt if this cotton was of American growth, but English writers[1] mention it as an import of Carolina cotton.

"Some cotton" is mentioned among the exports of Carolina in 1753, and of Charleston in 1757; and a London publication in 1762 says, "What cotton and silk both the Carolinas send us is excellent, and calls aloud for the encouragement of its cultivation in a place well adapted to raise both."[2]

In 1753 a liberal citizen of Delaware offered premiums for the promotion of industry, among them one of "£4 for the most and best cotton off an acre."

In 1770 there were shipped to Liverpool three bales from New York, four from Virginia and Maryland, and three barrels full from North Carolina.

The assembly of the province of Virginia, on the 27th March, 1775, in view of the changing relations with Great Britain, adopted a plan for the encouragement of arts and manufactures, including resolutions of non-importation; and "that all persons having proper land ought to cultivate and raise a quantity of hemp, flax, and *cotton*, not only for the use of his own family, but to spare to others on moderate terms." The planting of cotton had been recommended in the previous January by the first provisional Congress held in South Carolina.

In 1784, about 14 bales of American cotton were shipped to England, of which eight bales were seized in Liverpool as improperly entered, on the ground that so much cotton could not have been produced in the United States; and this was more than 150 years after the first importation to England of cotton grown in the same country. Thus slow was the progress of this culture. Just at the close of the eighteenth century was the beginning of the export trade which in the next 60 years was to grow to proportions so large in quantity and value, and so important in the trade of the world, as to involve the welfare of nations in its fate.

In 1785 five bags of cotton arrived at Liverpool from America.

[1] Cotton: an account of its culture in the Bombay Presidency, by W. R. Cassels, London, p. 5, and others.

[2] Quoted in Bishop's History of American Manufactures, in which work many references and citations were found which have been useful in the preparation of this chapter.

During the next five years the imports there of American cotton were, in 1786, 900 pounds; 1787, 16,350 pounds; 1788, 58,500 pounds; 1789, 127,500 pounds; and 1790, 14,000 pounds.

Upland cotton in 1788 was worth 2*s.* 2*d.* per pound, and only 10*d.* in 1790. This may account for the small shipments of American cotton in the latter year. It was probably of poorer staple than the upland of the present day.

EFFECT OF WHITNEY'S INVENTION OF THE SAW-GIN.

In 1794, the year after the completion of Whitney's saw-gin, the exports of the United States rose to 1,600,000 pounds, and to 5,250,000 pounds the next year. In 1805, ten years later, the exports had increased to 40,383,000 pounds.

COMPARATIVE PROGRESS OF BRITISH COTTON CONSUMPTION AND AMERICAN COTTON PRODUCTION.

The following table from Baine's History exhibits the quantities of cotton of all growths imported, exported, and retained for home consumption in Great Britain for each of seven years near the middle of the last century:

Imports and exports of cotton in Great Britain from 1743 *to* 1749.

Years.	Imported.	Exported.	Retained for home consumption.
	Pounds.	*Pounds.*	*Pounds.*
1743	1,132,288	40,870	1,091,418
1744	1,882,873	182,765	1,700,108
1745	1,469,523	73,172	1,369,351
1746	2,264,808	73,279	2,191,529
1747	2,224,869	29,438	2,195,431
1748	4,852,966	291,717	4,561,249
1749	1,658,365	330,998	1,327,367

From this table it appears that the average annual consumption of cotton in Great Britain for the seven years, 1743 to 1749, was 2,062,350 pounds; for the seven years 1794 to 1800, it was 32,543,000 pounds; and for the seven years 1844 to 1850, 555,000,000 pounds; an increase of sixteen fold in each fifty years.

The average annual production of cotton in the United States for the same period was, for the seven years 1743 to 1749, not enough for the home consumption of the colonies; as contributing to foreign commerce it was nothing; for the seven years 1794 to 1800 it was, as estimated, 30,000,000 pounds; and for the seven years 1844 to 1850 it was, 981,500,000 pounds; a thirty-two fold increase in each 50 years.

SEA ISLAND COTTON.

About the year 1786 the sea island or black seed cotton was introduced, it is said, from the Bahamas. During the revolutionary war, or

soon after, Kinsey Borden, of South Carolina, invented, or applied another's invention of a roller-gin, "composed of pieces of gun-barrels fixed in wooden rollers, turned by cranks," requiring two persons to use the machine, one to turn it and the other to feed in the seed cotton. His wife was said to have made the first attempt to grow the Sea Island cotton. But Mr. Seabrook says[1] that W. Elliott, on Hilton Head, was the first to grow a successful crop from five and a half bushels of seed purchased in Charleston, at 14 shillings per bushel. The price of Sea Island cotton was then 10*d.* to 2*s.* or 3*s.* per pound, according to quality. It was much improved afterwards by selection of seed and good culture, and its later value was 90 cents to $1 25 per pound.

COTTON CROPS IN THE UNITED STATES FOM 1791 TO 1867.

In 1791 the cotton crop in the United States was 2,000,000 pounds, of which three-fourths was grown in South Carolina and one-fourth in Georgia. Exports, 189,500 pounds, worth 26 cents, average.

In 1795 Frederick Almy wrote to his partner, Samuel Slater, the leader of cotton manufacturers in America, that Georgia cotton of good quality was offered him in New York at one shilling sixpence per pound. Cotton was then still imported. The import for the year was 4,107,000 pounds, and the export was 6,276,000 pounds.

In 1801 the cotton crop of the United States was 48,000,000 pounds, of which were contributed by South Carolina, 20,000,000; Georgia, 10,000,000; Virginia, 5,000,000; North Carolina, 4,000,000; Tennessee, 1,000,000 pounds. Export[2] 20,000,000 pounds.

[1] Bishop's History of American Manufactures.

[2] Prior to 1802 the tables of exports of cotton at the custom-house did not distinguish home-grown from foreign cotton. There were no full and reliable statistics, either commercial or official, of the cotton production and trade down to about 1825 "Woodbury's Tables and Notes on the Cultivation, Manufacture, and Trade in Cotton," being a report of the Secretary of the Treasury, March 4, 1836, (House Doc. 146, 24th Congress, first session,) purports to array together all statistics then obtainable in regard to cotton. That report contains a great deal that is valuable, but some parts are inaccurate and adopted without due consideration.

For instance, Woodbury's tables thus state the facts for the year 1801. Table A sets down the production of the world in pounds:

	Pounds.
In the United States	48,000,000
In Brazil	36,000,000
In the West Indies	10,000,000
In the rest of Africa, (excluding Egypt)	45,000,000
In India	160,000,000
In the rest of Asia	160,000,000
In Mexico and South America, (excluding Brazil)	56,000,000
Elsewhere	15,000,000
These items make a total of	530,000,000

He calls it 520,000,000 pounds, of which Great Britain that year imported only 56,000,000 pounds. Table C (Woodbury) says the price of American cotton in 1801 averaged 44 cents

1805. Export, 38,400,000.

1806. Mexican cotton seeds introduced to Mississippi by Walter Burling, of Natchez, and supposed to have improved the character of cotton there grown.

1813. During the war, export, 19,400,000 pounds; price at home, 12 cents; in England, 16*d.* to 26*d.* Of the cotton exported during the war, a considerable portion went in neutral vessels to Bremen and other neutral ports, whence doubtless it found its way to England.

1821. Crop, 180,000,000 pounds; exports, 124,000,000 pounds, price 16 cents here, in Liverpool 9½*d.*

1822. Crop, 210,000,000 pounds. Exports, 144,700,000 pounds; price, 16½ cents here; in Liverpool, 8¼*d.* to 10*d.* First cotton from Egypt received in Liverpool this year. Cotton culture began in Texas.

1825. Crop, 255,000,000 pounds. Exports, 176,500,000 pounds. The prospects of the crop were very unfavorable, following a deficient crop in 1824. The price advanced from 15 cents here and 8*d.* in Liverpool, at close of last season to 25 cents here and 11½*d.* in Liverpool. Consumption was reduced. There was no killing frost in the cotton States that winter, and some cotton plants "rattooned" (sprouted from old roots) the next spring. The late bolls were opening and picking continued all winter. The reduction of use and the unexpected increase of supply reversed the position, prices fell fast and far, involving many merchants in ruin. Cotton costing 25 cents in Charleston was sold in Liverpool after a long holding, so as to return to Charleston only six cents per pound. The price of "fair upland" remained below 7*d.* in Liverpool for the next seven years.

The number of cotton spindles in the United States this year was said to be 800,000, using 100,000 bales cotton per annum.

The following table gives complete statistics of the production and disposition of the cotton crops of the United States from 1826–'27, down to the present time.

per pound; and that the whole United States crop was worth $8,000,000. It will be observed that 48,000,000 pounds at 44 cents would amount to over $21,000,000. Table B (Woodbury) distinguishes the growth of the several States in 1801, as quoted in the text, the total being only 40,000,000 pounds, leaving 8,000,000 not located.

The work referred to is often quoted for statistical purposes, and even the errors above indicated have been cited without notice of their inconsistencies. Too large a portion of our cotton statistics, down to a recent period, have been taken by estimation. It is much to be desired that the Statistical Bureau established at Washington shall prepare and publish, periodically, full and reliable statistics concerning all the important branches of business in this country, similar to those issued by the British Board of Trade; and it is equally to be desired for the credit and business interests of the country that the Agricultural Bureau shall issue accurate statistics in place of its *estimates* of the cotton crop, which, from their supposed official character, have obtained credence, while erroneous beyond excuse, to the extent of about 300,000 bales in the statement of *production* of each of the last three crops.

Cotton crops of the United States from 1826-'27 to 1866-'67, inclusive.

	1826-'27.	1827-'28.	1828-'29.	1829-'30.	1830-'31.	1831-'32.	1832-'33.
From Georgia.................bales...	233, 920	153, 749	249, 166	253, 117	230, 502	276, 437	271, 925
From South Carolina.................do.....	179, 810	109, 733	168, 275	188, 871	185, 166	173, 872	181, 876
From North Carolina and Virginia.................do.....	112, 811	77, 422	104, 621	72, 362	70, 435	65, 961	61, 187
From Florida.................do.....	4, 163	3, 940	4, 146	5, 787	13, 073	22, 651	23, 641
From Alabama.................do.....	89, 707	71, 563	79, 958	102, 684	113, 186	125, 921	128, 366
From Louisiana.................do.....	336, 870	304, 186	264, 249	354, 024	426, 485	322, 635	403, 443
Total crop of the United States.................	957, 281	720, 593	870, 415	976, 845	1, 038, 847	987, 477	1, 070, 438
Average net weight per bale.................pounds....	331	335	341	339	341	360	350
Total net weight of crop.................do......	316, 860, 011	241, 398, 655	296, 811, 515	331, 150, 455	354, 246, 827	355, 491, 720	374, 653, 300
Export to Great Britain.................bales....	646, 000	425, 000	489, 000	596, 000	619, 000	628, 000	630, 000
Export to France.................do.....	158, 000	148, 000	185, 000	201, 000	127, 000	207, 200	207, 000
Export to other countries.................do.....	50, 000	27, 000	66, 000	42, 000	27, 000	56, 800	30, 000
Total export.................do.....	854, 000	600, 000	740, 000	839, 000	773, 000	892, 000	867, 000
Taken for home use.................do.....	149, 516	120, 593	118, 853	126, 512	182, 142	173, 800	194, 412
Stock in the ports, August 31.................do....	....	....	....	35, 000	119, 000	41, 600	48, 200

Cotton crops of the United States, &c.—Continued.

	1833-'34.	1834-'35.	1835-'36.	1836-'37.	1837-'38.	1838-'39.	1839-'40.
From Georgia .... bales	258, 665	222, 670	270, 121	262, 971	304, 210	205, 112	262, 693
From South Carolina .... do	227, 359	203, 166	231, 237	196, 377	294, 334	210, 171	313, 194
From North Carolina and Virginia .... do	77, 935	67, 569	61, 254	46, 759	55, 719	33, 336	33, 044
From Florida .... do	36, 738	52, 085	79, 762	83, 703	106, 171	75, 177	136, 257
From Alabama .... do	149, 978	197, 692	236, 715	232, 243	309, 807	251, 742	475, 725
From Louisiana .... do	454, 719	511, 146	481, 636	600, 877	731, 256	584, 994	956, 922
Total crop of the United States .... do	1, 205, 394	1, 254, 328	1, 360, 725	1, 423, 930	1, 801, 497	1, 360, 532	2, 177, 835
Average net weight per bale .... pounds ..	363	367	373	379	379	384	383
Total net weight of crop .... do	437, 558, 022	460, 338, 376	507, 550, 425	539, 290, 470	682, 767, 363	522, 444, 288	834, 110, 805
Export to Great Britain .... bales	756, 000	723, 000	771, 000	851, 000	1, 165, 000	798, 000	1, 247, 000
Export to France .... do	216, 500	252, 500	266, 000	261, 000	321, 000	242, 000	447, 000
Export to other countries .... do	55, 500	48, 000	79, 000	57. 000	89, 000	34, 000	182, 000
Total export .... do	1, 028, 000	1, 023, 500	1, 116, 000	1, 169, 000	1, 575, 000	1, 074, 000	1, 876, 000
Taken for home use .... do	196, 413	216, 888	236, 733	222, 540	246, 063	276, 018	295, 193
Stock in the ports August 31 .... do	29. 600	41, 600	43, 300	75, 800	40, 300	52, 250	58, 442

Cotton crops of the United States, &c.—Continued.

	1840–'41.	1841–'42.	1842–'43.	1843–'44.	1844–'45.	1845–'46.	1846–'47.
From Georgia .... bales...	148, 947	232, 271	299, 491	255, 597	295, 440	194, 911	242, 789
From South Carolina .... do ...	227, 400	260, 164	351, 658	304, 870	426, 361	251, 405	350, 200
From North Carolina and Virginia .... do...	28, 665	30, 750	24, 678	24, 219	36, 687	26, 919	20, 052
From Florida .... do...	93, 552	114, 416	161, 088	145, 562	189, 693	141, 184	127, 852
From Alabama .... do...	320, 700	318, 315	481, 714	467, 990	517, 196	421, 966	323, 462
From Louisiana .... do...	815, 690	727, 658	1, 060, 246	832, 171	929, 126	1, 037, 144	705, 979
From Texas .... do...	....	....	....	....	....	27, 008	8, 317
Total receipts at ports .... do...	1, 634, 954	1, 683, 574	2, 378, 875	2, 030, 409	2, 394, 503	2, 100, 537	1, 778, 651
Total crop of the United States .... do ...	1, 634, 954	1, 683, 574	2, 378, 875	2, 030, 409	2, 394, 503	2, 100, 537	1, 778, 651
Average net weight per bale .... pounds..	394	397	409	412	415	411	431
Total net weight of crop .... do...	644, 171 876	668, 378, 878	972, 959, 875	836, 528, 508	993, 718, 745	863, 320, 707	766, 598, 581
Export to Great Britain .... bales...	859, 000	936, 000	1, 470, 000	1, 202, 500	1, 439, 000	1, 102, 000	831, 000
Export to France .... do ...	348, 700	398, 000	346, 000	282, 700	359, 400	359, 700	241, 400
Export to other countries .... do...	105, 800	131, 500	194, 000	144, 300	285, 300	205, 000	168, 800
Total export .... do...	1, 313, 500	1, 465, 500	2, 010, 000	1, 629, 500	2, 083, 700	1, 666, 700	1. 241, 200
Taken for home use north .... do...	297, 288	267, 850	325, 129	346, 750	389, 000	422, 600	428, 000
Stock in the ports August 31 .... do...	72, 479	31, 807	94, 486	159, 772	98, 420	107, 122	214, 837

Cotton crops of the United States, &c.—Continued.

	1847-'48.	1848-'49.	1849-'50.	1850-'51.	1851-'52.	1852-'53.
From Georgia........bales..	254, 875	391, 372	343, 635	322, 376	325, 714	349, 490
From South Carolina........do....	261, 752	458, 117	384, 265	387, 075	476, 614	463, 203
From North Carolina and Virginia........do....	10, 420	27, 591	23, 361	32, 868	37, 122	58, 379
From Florida........do....	153, 776	200, 186	181, 344	181, 204	188, 499	179, 476
From Alabama........do....	436, 336	518, 706	350, 952	451, 748	549, 449	545, 029
From Louisiana........do....	1, 190, 733	1, 093, 797	781, 886	933, 639	1, 373, 404	1, 580, 875
From Texas........do....	39, 742	38, 827	31, 263	45, 820	64, 052	85, 790
All other receipts at ports........do....	....	....	....	527	175	640
Total receipts at ports........do....	2, 347, 634	2, 728, 596	2, 096, 706	2, 355, 257	3, 015, 029	3, 262, 882
Used south, not received at ports........do....	92, 152	138, 342	137, 012	99, 185	111, 281	153, 332
Total crop of the United States........do....	2, 439, 786	2, 866, 938	2, 233, 718	2, 454, 442	3, 126, 310	3, 416, 214
Average net weight per bale........pounds..	417	436	429	416	428	428
Total net weight of crop........do....	1, 017, 390, 762	1, 249, 984, 968	958, 265, 022	1, 021, 047, 872	1, 338, 060, 680	1, 462, 139, 592
Export to Great Britain........bales...	1, 324, 000	1, 538, 000	1, 107, 000	1, 418, 265	1, 668, 749	1, 736, 860
Export to France........do....	279, 000	368, 000	289, 500	301, 358	421, 375	426, 728
Export to other countries........do....	255, 000	322, 000	193, 700	269, 087	353, 522	364, 812
Total export........do....	1, 858, 000	2, 228, 000	1, 590, 200	1, 988, 710	2, 443, 646	2, 528, 400
Taken for home use north........do....	523, 892	504, 143	476, 486	386, 429	588, 322	650, 393
Taken for home use south........do....	92, 152	138, 342	137, 012	99, 185	111, 281	153, 332
Stock in the ports, August 31........do....	171, 468	154, 753	167, 930	128, 304	91, 176	135, 643

Cotton crops of the United States, &c.—Continued.

	1853-'54.	1854-'55.	1855-'56.	1856-'57.	1857-'58.	1858-'59.
From Georgia .... bales ..	316, 005	378, 694	389, 445	322, 111	282, 973	475, 788
From South Carolina .... do....	416, 754	499, 272	495, 976	397, 331	406, 251	480, 653
From North Carolina and Virginia .... do....	42, 450	63, 739	58, 685	53, 652	54, 965	108, 639
From Florida .... do....	155, 444	136, 597	144, 404	136, 344	122, 351	173, 484
From Alabama .... do....	538, 684	454, 595	659, 738	503, 177	522, 364	704, 406
From Louisiana .... do....	1, 346, 925	1, 232, 644	1, 661, 433	1, 435, 000	1, 576, 409	1, 669, 274
From Texas .... do....	110, 325	80, 737	116, 078	89, 882	145, 286	192, 062
All other receipts at ports .... do....	3, 440	1, 061	2, 086	2, 022	3, 363	47, 175
Total receipts at ports .... do....	2, 930, 027	2, 847, 339	3, 527, 845	2, 939, 519	3, 113, 962	3, 851, 481
Used south, not received at ports .... do....	144, 952	135, 295	137, 712	154, 218	143, 377	167, 433
Total crop of the United States .... do....	3, 074, 979	2, 982, 634	3, 665, 557	3, 093, 737	3, 257, 339	4, 018, 914
Average net weight per bale .... pounds..	430	434	420	444	442	447
Total net weight of crop .... do....	1, 322, 240, 970	1, 294, 463, 156	1, 539, 533, 940	1, 373, 619, 228	1, 439, 743, 838	1, 796, 454, 558
Export to Great Britain .... bales...	1, 603, 750	1, 549, 716	1, 921, 386	1, 428, 870	1, 809, 966	2, 019, 252
Export to France .... do....	374, 058	409, 931	480, 637	413, 357	384, 002	450, 696
Export to other countries .... do...	341, 340	284, 562	552, 583	410, 430	396, 487	551, 455
Total export .... do....	2, 319, 148	2, 244, 209	2, 954, 606	2, 252, 657	2, 590, 455	3, 021, 403
Taken for home use north .... do....	592, 284	571, 112	633, 027	665, 718	452, 185	760, 218
Taken for home use south .... do....	144, 952	135, 295	137, 712	154, 218	143, 377	167, 433
Stock in the ports, August 31 .... do....	135, 603	143, 336	64, 171	49, 258	102, 926	149, 237

Cotton crops of the United States, &c.—Continued.

	1859-'60.	1860-'61.	1861-'65.*	1865-'66.	1866-'67.	1867-'68.
From Georgia....bales...	531, 219	477, 584	....	263, 373	255, 965	495, 005
From South Carolina....do...	510, 109	336, 339	....	112, 273	162, 247	240, 225
From North Carolina and Virginia....do...	98, 181	134, 427	....	102, 090	62, 149	226, 074
From Florida....do...	192, 724	121, 172	....	149, 139	58, 349	34, 639
From Alabama....do...	843, 012	546, 794	....	429, 102	239, 516	366, 193
From Louisiana....do...	2, 139, 425	1, 751, 599	....	711, 629	702, 131	579, 231
From Texas....do...	252, 424	144, 747	....	174, 985	185, 919	114, 666
All other receipts at ports....do...	108, 676	143, 424	....	211, 885	365, 712	374, 860
Total receipts at ports....do...	4, 675, 770	3, 656, 086	....	2, 154, 476	2, 031, 988	2, 430, 893
Used south, not received at ports....do...	185, 522	193, 383	....	187, 640	286, 672	168, 348
Total crop of the United States....do...	4, 861, 292	3, 849, 469	....	2, 342, 116	2, 318, 660	2, 599, 241
Average net weight per bale....pounds..	461	477	....	441	444	445
Total net weight of crop....do...	2, 241, 055, 612	1, 836, 196, 713	....	1, 032, 873, 156	1, 029, 485, 040	1, 266, 662, 245
Export to Great Britain....bales...	2, 669, 432	2, 175, 225	....	1, 262, 271	1, 216, 262	1, 228, 596
Export to France....do...	589, 587	578, 063	....	220, 650	198, 147	197, 515
Export to other countries....do...	515, 154	374, 280	....	71, 743	142, 645	229, 705
Total export....do...	3, 774, 173	3, 127, 568	....	1, 554, 664	1, 557, 054	1, 655, 816
Taken for home use north....do...	792, 521	650, 357	....	544, 085	653, 367	799, 817
Taken for home use south....do...	185, 522	193, 383	....	187, 640	286, 672	168, 348
Stock in the ports, August 31....do...	227, 708	83, 187	....	283, 692	80, 296	37, 398

* Four years of war, void.

DEFECTIVE STATISTICS.

The annual statements of the cotton crops of the United States, prepared and published by the New York Shipping List, have for many years been recognized as supplying the standard statistics of cotton in this country, by the trade at home and abroad. So long as the entire crop (with immaterial exception, after supplying southern consumption) was shipped from ports in the cotton-producing States by sea, either coastwise or foreign, the method followed by the Shipping List was right and attained to very nearly accurate results.

Before the war, some lines of railway had been completed connecting the cotton States with the north, and the western States with the east, upon which low rates of freight invited the transportation of cotton northward and eastward, especially for the cotton mills of New York and New England. This was interrupted by the war, but in 1864–'65 it was resumed, and the *inland* transportation of cotton will this year probably exceed 600,000 bales. The old method of making up the annual statements is therefore liable to serious errors, and a change has become necessary. The preceding table follows very nearly the figures of the Shipping List in the amount of the annual crops and their distribution, to avoid conflict and preserve conformity with data hitherto recognized as correct, (and properly so down to the year 1865–'66.)

It should be noted that there was no separate account of the cotton used in the south ("south of the Potomac and west of Virginia," as phrased in the Shipping List) until the season of 1847–'48. In the crop statements, annual quantities as large as 185,000 and 193,000 bales had been allotted for use in the south out of the cotton crop supposed to be baled and prepared for market. The entire *spinning* capacity of the machinery in the south before the war was never equal to the consumption of 90,000 bales. Yet the statement may have been nearly correct. There was a large use of cotton, both north and south, for other purposes than spinning; as for mattresses, and various kinds of upholstery. Many thousand cotton mattresses for beds were annually made in the south, for use there, and for shipment north. Indeed, during the war, when the scarcity of cotton became serious and its price advanced to \$1 50 or more per pound, the contents of mattresses broken up in the northern States added materially to the supply of cotton for spinning. But since the war, the value of cotton has been too high to permit its use for such purposes; hence the error of assigning to the south, as consumed there, twice as much cotton as all her spinning power can use.

The weights per bale given in the table are net weights, to correspond with the British and other foreign statistics, where the weight is given less the tare. The cotton year in the United States ends September 30.

BRITISH INDIA.

CULTURE AND IMPORTS OF COTTON.

India contributes a supply of cotton next in importance to that from the United States. The earliest recorded importation of raw cotton from India to England (if not to Europe) was in 1783, when the quantity from India was only 114,133 pounds, in a total import from all countries of 9,735,663 pounds. India had supplied Great Britain with cotton yarn and cloth long before she furnished a pound of the raw material.[1]

Such was the devotion to and care of the woollen manufacture in Great Britain, that great efforts were made, and with much success for a long time, to prevent or restrain the importation of calicoes and other Indian cotton goods, by excessive duties and vexatious restrictions; and this opposition to the trade from India continued for more than a century after the organization of the British East India Company. As late as the year 1700 an act of Parliament was passed interdicting the further importation of Indian goods, and in 1721, because of their continued introduction by smugglers, another act was passed imposing a penalty of £5 upon any person wearing such goods.[1]

For many years the import of cotton from India to Great Britain was very small, as will appear by the following table:

Imports of cotton from India to Great Britain.

Years.	Import of all growths.	Import from India.	Years.	Import of all growths.	Import from India.
	Pounds.	*Pounds.*		*Pounds.*	*Pounds.*
1783	9,735,663	114,133	1789	32,576,023	4,973
1784	11,482,083	11,440	1790	31,447,605	422,207
1785*	18,400,384	99,455	1791	28,706,675	3,351
1786	19,475,020	....	1800	56,010,732	6,629,822
1787	23,250,268	....	1801	56,004,305	4,098,256
1788	20,467,436	....			

* Arkwright's patent expired and Watt's steam-engine was applied in 1785.

The following table shows the comparative imports of American and Indian cottons, and the relative prices of Upland and Surats for the five years 1812 to 1816, (quoted from Cassell:)

Imports of American and Indian cottons.

Years.	Total imports into Great Britain.	Imports from the United States.	Imports from the East Indies.	Exports of all growths.	Prices.	
					Upland.	Surats.
1812	63,025,936	26,000,000	915,950	1,740,912	13d. to 23½d.	12d. to 16d.
1813	50,966,000	(*)	497,350	No record.	21d. to 30d.	15½d. to 20d.
1814	60,060,239	(*)	4,725,000	6,292,437	23d. to 37d.	18d. to 25d.
1815	99,306,343	45,666,000	8,505,000	6,780,392	18d. to 25½d.	14½d. to 21d.
1816	93,920,055	57,750,000	10,850,000	7,105,034	15d. to 21d.	14d. to 18½d.

* War between the United States and Great Britain.

[1]Cassell's Cotton Culture in the Bombay Presidency, p. 2.

In another place[1] will be found a full and comprehensive table of the statistics of British cotton trade and manufacture from 1816 to 1868, inclusive.

EXPORTS AND CONSUMPTION.

The exports of cotton from India to Europe must not be taken as the measure of the *production* there, in any degree corresponding to the proportion which our exports to Europe bear to our production. The extent of the entire production of India has been much discussed by officials, economists, and others, who differ more or less widely in their conclusions. The usual bases of calculation have been the assumed area of land cultivated for cotton; and the population (180,000,000) requiring to be clothed almost entirely with cotton, at so many pounds of cotton per capita in addition to the known exports.

The consumption of cotton in India for clothing and other domestic uses was estimated by Major General Briggs at 750,000,000 pounds, equal to 2,000,000 bales, (of 375 pounds each,) and by Dr. Wight at 3,000,000,000 pounds, equal to 8,000,000 bales. These may be regarded as the extremes, while Dr. Forbes Watson estimated the whole production at 2,432,395,875 pounds, equal to 6,500,000 bales of 375 pounds each, which he divided thus:

For home consumption in India..	2,160,000,000 pounds,	5,760,000 bales.
For exportation................	272,395,875 pounds,	740,000 bales.

After much discussion Dr. Watson's estimate has been accepted with general favor, although Mann, the very careful writer upon cotton statistics, says: "I am disposed to think, however, that Dr. Watson's estimate is rather over than under the mark."[2]

Assuming that Dr. Watson's estimate of the cotton production of India in 1858 was correct, when stating it at 2,432,395,875 pounds, and comparing it with the total production of the United States in the same year, 1,796,454,558 pounds, it appears that India produced (in pounds) 35 per cent. more cotton than the United States.

The exports of cotton from all India and from each presidency, in annual averages of quinquennial periods for 24 years down to 1858, are stated in the following table, taken from Mann's statistics:

Exports of cotton from all India.

Years.	Bombay.	Madras.	Bengal.	Total, all India.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
1835–'39	91, 309, 665	13, 576, 300	31, 380, 575	136, 266, 540
1840–'44	141, 802, 690	18, 992, 400	13, 976, 820	174, 771, 910
1845–'49	133, 886, 826	13, 969, 569	9, 900, 497	157, 756, 892
1850–'54	179, 838, 889	18, 770, 256	22, 663, 188	221, 272, 333
1855–'58	222, 076, 713	15, 962, 242	9, 702, 974	247, 741, 929

[1]See Appendix D.

[2]The Cotton Trade of Great Britain, by James A. Mann, F. S. S., &c., 1860, p. 65.

The distribution of these exports was as follows:

Years.	Great Britain.	China and other parts.	Total.
	Pounds.	*Pounds.*	*Pounds.*
1835-'39	51, 161, 059	85, 105, 481	136, 266, 540
1840-'44	88, 868, 685	85, 903, 225	174, 771, 910
1845-'49	70, 757, 425	86, 999, 467	157, 756, 892
1850-'54	130, 557, 160	90, 715, 173	221, 272, 333
1855-'58	185, 229, 082	62, 512, 847	247, 741, 929

Bombay supplies a large portion of the exports of cotton from all British India, and fortunately the statistical information from that presidency is quite full. From Bengal and Madras only partial returns have been accessible.

Table of exports of cotton from Bombay, showing their distribution, for the eleven years 1858 *to* 1868, *inclusive.*

Years.	Great Britain.	Cowes, &c., for orders.	Other ports of Europe.	United States.	China.	Total bales.	Total pounds.
	Bales.	*Bales.*	*Bales.*	*Bales.*	*Bales.*		
1858	324, 675	13, 993	19, 542	....	103, 731	461, 941	177, 847, 285
1859	564, 886	25, 314	27, 634	....	151, 847	769, 681	297, 866, 547
1860	469, 611	5, 525	17, 257½	....	202, 179	694, 572½	270, 883, 275
1861	931, 077	18, 560½	8, 426½	....	60, 511	1, 018, 575	397, 244, 250
1862	923, 140	3, 757½	20, 833	....	7, 934½	955, 665	372, 709, 350
1863	945, 454½	2, 867	48, 788	3, 394	....	1, 000, 503½	390, 196, 365
1864	873, 627	....	54, 021½	706	....	928, 354½	362, 058, 255
1865	1, 074, 158	....	36, 362	800	13, 401½	1, 124, 721½	438, 641, 385
1866	922 330	....	33, 205½	....	4, 619½	960, 155	367, 739, 365
1867	1, 056, 357	....	71, 374	....	48, 236	1, 175, 967	449, 219, 394
1868	1, 034, 383	4, 216	145, 736	....	55, 449	1, 239, 784	477, 597, 488

The foregoing table, compiled from accurate commercial sources, is entirely correct, except possibly a small error in the exports of the last sixteen days of 1868, which have been taken from telegraphic advices. The aggregates are substantially right; the weights calculated from the average net weight of the Bombay cotton in England each year.

The eleven years embraced in the table include three quite distinct periods: The three years (1858-'60) before the secession war had begun to influence the cotton trade of the world; the four years of the war, 1861-'64, in two of which the export of cotton to China ceased, all of the exportable cotton of India being required for the western nations; and China, for many hundred years an importing country, not only stopping its importation for the time, but contributing from its own deficient product a portion towards making good the greater deficiency in Europe;

and four years, 1865–'68, since the close of the war, a period marked by extraordinary fluctuations, the price for fair Surats at Liverpool falling from 21*d.*, the average of 1864, to 8¾*d.*, the average of 1867, which also was the average of the year 1868, and the price at its close. It will be observed that the exports from Bombay have not fallen off, but have rather increased, notwithstanding the comparatively low range of price in the average of the last two years.

The value of cotton exported from Bombay during the two years 1858 and 1859 was declared below £8,000,000 (eight millions pounds sterling) for both years. The value for the two years 1863 and 1864 was more than £55,000,000, (fifty-five millions sterling,) and at the selling value of the portion which reached Liverpool it was nearly £60,000,000, equal to $300,000,000 gold.

The scarcity of cotton caused by the war compelled the consumption of all surplus reserves before the power of high prices and the strenuous efforts of governments, companies, and individuals everywhere interested had extended the production in other countries to a supply adequate even to the greatly reduced consumption. The renewal of production in the United States aiding the continued production of other countries has relieved the scarcity, but has not yet sufficed to replace the requisite reserves; nor could it supply such an increased consumption as would ensue upon a return to former low prices, and is demanded by the increase of population and the wants of trade.

The usual export of cotton from Bombay before the war was less than 700,000 bales per annum. This was not more than 12 per cent. of the total production, as the estimates of the latter were stated on a previous page. Under the influence of war prices the export has increased 50 to 60 per cent. At first, in 1861 and 1862, that increase was drawn from the existing reserves by stinting the home consumption. But it is reasonable to suppose that in later years the excess of former exports is the result of increased production stimulated by price and demand, facilitated by great extension of railways, and promoted by the inflow of an immense amount of money. The increase has probably reached its maximum, except as some peculiarly favorable season may enlarge the product of a year. The cost of production has been enhanced, and notwithstanding the advantages of railway transportation, it is not to be expected that India cotton will continue to be exported to Europe after its price shall have fallen to 4½*d.* per pound for *fair Dhollera*, as in former times, if excess of supply shall bring that about.

One large crop in the United States, in India, and other countries, simultaneously, would present a supply exceeding the present consumption of the world by more than 1,000,000 bales. Whenever this shall occur, and it may soon, the ability of each country to continue the contribution of its quota of cheap cotton will be tested.

Much space has been given to the cotton statistics of the Bombay presidency, because its cotton constitutes about two-thirds of the whole

East Indian supply. The exports from Calcutta (the Bengal cotton) were distributed as follows for three years:[1]

Years.	Great Britain.	France.	China.	Total bales.	Total pounds.
	Bales.	*Bales.*	*Bales.*		
1865	159,487	3,216	87,568	250,271	75,081,300
1866	337,030	4,698	69,702	411,430	122,606,140
1867	235,510	6,314	191,041	432,865	128,128,040

Without complete and reliable statistics from Madras for recent years, an approximation to the exports from that presidency for the three years 1865–'67 is attained by taking the import of Madras cotton to Great Britain and assigning to that a proportion of the whole export similar to that from Bengal. (The export from Madras for one year corresponds very nearly with the imports into Great Britain during the last seven months of that year and five months of the next year.) Thus ascertained, the export from Madras to Great Britain stands:

For 1865............... 175,000 bales, weighing 52,500,000 pounds.
For 1866............... 275,000 bales, weighing 82,500,000 pounds.
For 1867............... 276,000 bales, weighing 82,800,000 pounds.

Assuming that the Madras export, other than to Great Britain, (to China, &c.,) bears a proportion much less than that from Calcutta and Bombay, the total export from the Madras presidency, for 1867, was approximately 300,000 bales, equal to 90,000,000 pounds.

The total export of cotton in the year 1867 from the three presidencies, besides clothing their 180,000,000 of people, was thus:

	Bales.	Pounds.
From Bombay	1,175,967	449,219,394
From Bengal	432,865	128,128,040
From Madras, estimated	300,000	90,000,000
From all India	1,908,832	667,347,434

COTTON CULTURE IN EGYPT.

It has been stated that cotton was grown in Upper Egypt in the time of Pliny, but the cultivation had been long discontinued, when, about the year 1821, that energetic viceroy, Mehemed Ali, having made some successful experiments in cotton planting, began the cultivation on a large scale in Upper Egypt. The result was very favorable. The product of the first year was 60 bags; the second year, 50,000; the third year, 120,000; and in 1824 140,000 bags were obtained.[2] The bags varied in weight from 180 to 240 pounds.

[1] See on page 38 a table showing the export of Bengal cotton down to 1858.

[2] Baine's History of Cotton Manufacture, page 306.

In 1827 or 1828 a quantity of seed of the Sea Island cotton was planted in Egypt, where it flourished, and yields cotton second only to the American Sea Island. About 1833 or 1834 the cultivation of cotton in Egypt fell to an inconsiderable quantity, but was afterwards increased, as appears from the table of the quantities exported from Alexandria during the ten years 1850–'59:

	Pounds.		Pounds.
1850	46, 059, 965	1855	56, 874, 300
1851	30, 347, 338	1856	54, 419, 904
1852	66, 424, 960	1857	49, 489, 552
1853	43, 885, 201	1858	52, 369, 408
1854	43, 546, 500	1859	49, 259, 210

Averaging about 49,000,000 pounds, or 95,000 bales per annum.

In Egypt, as elsewhere, the American war gave a new and forcible impetus to the cotton culture. Unfortunately the exact statistics are not at hand. The crops of 1864 and 1865 were very large, say 360,000 and 340,000 bales respectively. In 1866 and 1867 they fell off to 210,000 and 225,000 bales. The crop of 1868–'69 is estimated as equal to that of 1865, say 340,000 bales of 500 pounds each.

It seems to be the fact that cotton culture in Egypt has reached its highest point, even under high prices, in the present condition of that country; and that with lower prices the production will fall away and give place to grain crops.

BRAZIL.

The Maranham Company exported the first cotton from Brazil about 1760. The limited demand for it in Europe appears from this incident: A Portuguese merchant, in 1762, bought at the company's sale 300 bags, (the wild cotton of the province,) at 300 reis per pound. He sent it to Rouen, the only market, but was a loser because of the peace of 1763. At the next sale there was no bidder for any large quantity. The directors took it at 160 reis, and were also losers.[1]

England first received cotton from Brazil in 1782, although the Dutch colony of Surinam had sent cotton to Holland as early as 1735; thus early making known the quality of South American cotton. Its time had not then come. Soon after the introduction of Pernambuco cotton to Great Britain, the value of its staple was discovered, and as early as 1825 there was a large import to England of Brazil cotton.

[1] Southey's History of Brazil, quoted in Bishop's American Manufactures.

EXPORTS FROM BRAZIL.

The exports from Brazil from 1840 to 1855 were stated in Mr. Ellison's hand book, as follows:

	Pounds.		Pounds.
1840	22,335,520	1848	20,457,116
1841	22,140,030	1849	27,181,312
1842	20,466,566	1850	35,498,048
1843	22,324,718	1851	28,270,080
1844	26,056,160	1852	28,744,000
1845	26,446,240	1853	31,933,056
1846	20,651,040	1854	28,551,584
1847	19,419,224	1855	27,838,720

While there is no apparent limit to the capacity of Brazil to produce cotton on account of soil, climate, or other natural condition, economic reasons seem to have fixed an early limit. There was but very little increase in the production during the 16 years above stated. The reason is probably to be found in the greater profit of other crops, especially of coffee. During and since the war the cotton culture of Brazil has been largely extended. The import to Great Britain alone was in—

Year.	Bales.	Weight per bale.	Pounds.
		Pounds.	
1864	212,190	180	38,194,200
1865	340,260	160	54,441,600
1866	407,650	174	70,931,100
1867	437,210	162	70,828,020
1868	636,897	155	98,719,035

Here was a progressive increase, and the estimate for the crop of 1868–'69 calls for further increase. It remains to be seen if the extension of this culture in Brazil is to be permanent and progressive, irrespective of occasional depressions of price; or if, upon the recurrence of a low range of prices, the effect of over supply, cotton will not again give place to the more profitable coffee.

WEST INDIES AND GUIANA.

At the time of the discovery of these islands by Columbus, the cotton plant was cultivated, and large quantities of its fiber were manufactured by the natives. The early cotton manufacture of England and other parts of Europe was supplied chiefly from the West Indian colonies, and from the Levant. In 1787 Great Britain imported from her West Indian colonies 6,600,000 pounds of cotton, or about 38 per cent. of the entire import to the United Kingdom. Our own early importations of cotton were chiefly from the same source. The quality is generally good, especially that produced in Guiana from the black seed, ranking nearly with the Egyptian.

The successful culture of cotton in the United States, and consequent low prices, had caused a great falling off in the West Indies, where sugar became the preferred crop as more profitable. British emancipation next occurred, and almost caused the abandonment of cotton culture. The diminution is shown in the following table of British imports from the West Indian colonies, embracing nearly the whole product for the several years.[1] They were from—

British imports of cotton from the West India colonies.

Years.	Demarara.	Berbice.	Grenada.	St. Vincent.	Barbadoes.	The Bahamas.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
1831	979, 720	554, 083	141, 038	49, 576	333, 405	183, 794
1836	818, 648	262, 049	117, 935	71, 864	121, 752	157, 118
1841	83, 285	3, 154	61, 776	49, 622	99, 032	925, 751
1846	275, 901	113, 638	9, 335	53, 382	380, 248	257, 507
1851	157, 596	....	24, 715	42, 687	86, 948	8, 532
1856	210, 560	....	67, 760	35, 616	51, 632	....
1857	112, 224	....	42, 336	69, 328	28, 000	1, 113, 392
1858	227, 696	....	57, 476	57, 120	3, 472	....

In 1809, Great Britain imported from all countries 440,382 bales, of which there were from the United States, 160,180 bales; from Brazil, 140,927 bales; from the East Indies, 35,764 bales; from the West Indies, &c., 103,511 bales. In 1815, the imports by Great Britain were 100,709,146 pounds; from the United States, 54,407,299 pounds; from the British West Indies and Guiana, 15,341,197 pounds; from all other sources, 30,960,650 pounds.

In 1859, the production of cotton in the British West Indies and British Guiana had so fallen off that the total import to Great Britain from all those possessions was only 6,800 bales, or 592,256 pounds.

Here, as elsewhere, high prices, the effect of our war, induced a rapid restoration of the cotton culture. Nearly all the production of those British possessions is exported to Great Britain; therefore there will be no material error in taking the British imports as the measure of the colonial production for the last three years: 1866, 41,193 bales; 1867, 43,446 bales; 1868, 20,630 bales. The imports from the British West Indies in 1864 and 1865 were respectively 59,645 and 131,120 bales; but the greater part of these was of cotton from the United States which had run the blockade.

In Turkey, &c., prior to the war, its stint of cotton and high prices, the commercial supply of cotton from Turkey and other countries on the Mediterranean (Egypt excepted) was too small to find separate mention in the commercial or any general statistics of the cotton trade.

There, where cotton was first transplanted from the east, its cultiva-

[1] Mann's Cotton Trade of Great Britain, p. 81.

tion had long ceased, except for domestic use and as an insignificant article of local trade.

Following the universal rule, there also the culture of cotton was quickly extended so as to afford a contribution of some magnitude towards the needed supply after 1862. The statistics of that production are not accessible to us. The imports of cotton from Turkey, Greece, &c., to Great Britain, for the last five years, were:

1864	62,052 bales.	1867	16,615 bales.
1865	80,303 bales.	1868	12,623 bales.
1866	32,632 bales.		

To these should be added the quantities taken for use in France and other portions of the continent of Europe. The rapid decline in the production from 1865 to 1868 will be observed. It indicates a probable cessation of the culture for export whenever the United States and other countries of abundant and cheap production shall again offer to the commercial world a full supply of cotton for its wants.

OTHER COUNTRIES, AND COMPARATIVE VALUE OF AMERICAN AND FOREIGN COTTON.

The leading cotton-producing countries—the United States, the East Indies, Egypt, Brazil, the British West Indies, and Guiana, and the countries bordering upon the Mediterranean—having been passed in a rapid review of their past and present cotton supply, it remains only to notice briefly the culture in other countries, extended or called into existence by the recent famine and its prices.

Samples from all these countries, showing the comparative length and quality of their respective staples, were exhibited at the Universal Exposition in a very interesting and well-prepared collection by the Manchester Cotton Supply Association. Through the courtesy of the officers of that association (acknowledged in the first part of our report) a similar but even more complete collection of samples was prepared for and brought home by the commissioner for cotton who makes this report.

During the war, and under the influence of high prices, experiments were made with both black and green seed wherever cotton planting was attempted, with few exceptions—the former of American Sea Island and Egyptian, and the green seed principally of New Orleans and other superior staples. Australia, the South Pacific islands, South Africa, and the west coast of South America produced fine specimens of long stapled (black seed) cotton, vieing in spinning value with the best staples from Egypt, Surinam, Pernambuco, &c. Eastern Europe and western Asia exhibited specimens of green seed cotton grown from New Orleans seed that were much better than the native cotton, and quite equal to the upland cotton of the same grade in the United States, as were a few of the specimens from India obtained from the same seed.

The commissioner is so convinced that cotton culture in most of the

places where these experiments were made will cease with the high prices that induced them, that he deems it unnecessary to make mention of them separately. The samples are all interesting as displaying evidences of what can be done under the power of price or necessity, and useful to the people where they were successful in testing the fitness of soil, climate, and other conditions for cotton growing. But cotton growing will be a leading business permanently only in those countries where it can be made more profitable than other pursuits. Where indigo, rice, tobacco, sugar, coffee, or breadstuffs will pay better, or will better suit the soil, or climate, or the necessities, habits, or other conditions of a people, than cotton, the culture of cotton may be temporarily forced by the power of high price as well as by the decree of a Pacha, or by the well-directed efforts of a resolute, intelligent, and persistent manufacturing people; but it will be only temporary, like any other enforced industry attempted in defiance of the laws of true economy.[1]

Those laws find a parallel and illustration in the laws governing the vegetable world. Indian cotton seed brought to the United States (from where it is a native to where it is an exotic) will produce a better cotton here than in India, tending to longer and better staple continually. On the contrary, New Orleans seed planted in India will produce cotton the first year nearly equal to its original, but every year of reproduction from the same seed will exhibit more and more deterioration until the product shall have assimilated to the native Indian cotton. The conditions of the two countries cause the characteristics of cotton to determine in opposite directions; hence the necessity for frequent renewals of good staple seeds in India. It is forcing a temporary deviation from nature's course, but always the tendency is to obey the natural law.

COMPARATIVE VALUES OF AMERICAN AND OTHER KINDS OF COTTON.

The classification or grading of cotton is not applied uniformly to the cotton of all countries, even in Liverpool, where all are found in market. "Fair" cotton from any part of the United States is a very high grade, almost clear of impurities and defects. It is four grades higher than the American "middling," yet the latter is a better grade in point of cleanliness than the grade of "fair" in Surats and some other sorts.

These incongruities make it difficult to convey to any one not familiar with the trade and its technicalities a proper idea of the relative value of the several kinds of cotton by the quotations of a price list. The following arrangement, classing American "middling" with the "fair" cotton of other countries, will bring them all nearly to uniformity of cleanliness and appearance. Differences of price from a common level will then indicate the relative values of all kinds by their merits for

[1]See, in the Appendix I, a report from the London Times of the last meeting of the Cotton Supply Association.

spinning. The prices are those of December 30, 1868, at Liverpool, per pound:

Long staple or black seed varieties.		Mobile, middling,	$10\frac{3}{4}d$
Sea Island, middling,	$23d$	Upland, middling,	$10\frac{7}{8}d$
Egyptian, fair,	$11\frac{1}{2}d$	Smyrna, &c., fair,	$9\frac{1}{2}d$
Peruvian, fair,	$11\frac{1}{2}d$	Surats, Dharwars, fair,	$9\frac{3}{8}d$
Pernambuco, fair,	$11\frac{1}{4}d$	Surats, Dhollerahs, fair,	$8\frac{5}{8}d$
West Indian, fair,	$11d$	Madras, fair,	$8\frac{1}{4}d$
Green seed varieties.		Bengal, fair,	$7\frac{1}{4}d$
New Orleans, middling,	$11d$		

ANNUAL STATEMENT OF COTTON SUPPLY.

Annual cotton statistics are made up in the United States to the 31st of August, and in Great Britain, and Europe generally, to December 31st. To make up tables for both Europe and the United States in which the statistics of Europe shall conform in date to our crop statements, the account must be taken in Europe about September 30. For the greater part of the European statistics of that date we are indebted to the valuable tables of M. Ott-Trümpler, of Zurich.

SUPPLY AND CONSUMPTION OF COTTON.

Table of the supply and consumption of cotton in all Europe and the United States for the year 1859–'60.

Supply and consumption.	Bales.	Pounds.	Bales.	Pounds.
Stocks of cotton in ports—				
In Europe September 30, 1859			750,000	315,750,000
In the United States August 31, 1859			150,000	67,050,000
			900,000	382,800,000
Cotton crop of the United States for the year ending August 31, 1860	4,861,000	2,192,311,000		
Import to Europe for year ending September 30, 1860—				
From India	700,000	267,400,000		
From Brazil	127,000	22,987,000		
From Egypt and others	167,000	68,470,000		
			5,855,000	2,551,168,000
Total supply, Europe and America, for the year			6,755,000	2,933,968,000
Consumption in the United States	978,000	441,078,000		
Consumption of American cotton in Spain, Russia, and Sweden	168,000	75,768,000		
Consumption in Great Britain, all kinds	2,560,000	1,113,600,000		
Consumption in rest of Europe	1,577,000	654,455,000		
			5,283,000	2,284,901,000
Stocks on hand in United States August 31, 1860		228,000		
Stocks on hand in Europe September 30, 1860		1,244,000		
			1,472,000	649,067,000

The foregoing table, or statement of 1859–'60, represents the year of largest supply ever known. Compare with it the following statement of the last complete cotton year, 1867–'68:

Supply and consumption of cotton in Europe and the United States for the years 1867–'68.

Supply and consumption.	Bales.	Pounds.	Bales.	Pounds.
Stocks of cotton in ports—				
In Europe September 30, 1867			1,092,000	404,040,000
In the United States August 31, 1867			80,000	35,200,000
			1,172,000	439,240,000
Cotton crop of the United States for the year ending August 31, 1868	2,600,000	1,157,000,000		
Import to Europe for year ending September 30, 1868—				
From India	1,312,000	478,880,000		
From Brazil	675,000	106,650,000		
From Egypt	233,000	116,500,000		
From others	330,000	66,000,000		
			5,150,000	1,925,030,000
Total supply, Europe and America			6,322,000	2,364,270,000
Consumption in the United States	968,000	430,760,000		
Consumption of American cotton in Spain, Russia, and Sweden	35,000	15,575,000		
Consumption in Great Britain, all kinds	2,822,000	1,001,810,000		
Consumption in rest of Europe	1,845,600	645,960,000		
			5,670,600	2,094,105,000
Stocks on hand in the United States August 31, 1868	37,400			
Stocks on hand in Europe September 30, 1868	614,000			
			651,400	270,165,000

M. Trümpler's tables exclude the cotton trade of Spain, Russia, and Sweden. The entire cotton crop of the United States being stated on the side of supply, it is necessary to state on the side of consumption the export of United States cotton to those countries.[1]

[1] See, in the Appendix G, a table of exports of American cotton to Spain, Russia, and Sweden and Norway, 1849 to 1867.

Table of the supply and consumption of cotton in all Europe and the United States, stated for a comparison of the three years 1858–'59 *to* 1860–'61 *with the two years* 1866–'67 *and* 1867–'68, *(the year ending August* 31 *in the United States, and September* 30 *in Europe.)*

Years.	Stocks at beginning of year—Europe and United States.	Crop of United States.	Imports to Europe of other sorts.	Total supply, Europe and United States.	Stocks at end of season.	Consumption—Europe and United States.	
	Bales.	*Bales.*	*Bales.*	*Bales.*	*Bales.*	*Bales.*	*Pounds.*
1858–'59	746,000	4,019,000	841,000	5,606,000	900,000	4,706,000	1,976,520,000
1859–'60	900,000	4,861,000	994,000	6,755,000	1,472,000	5,283,000	2,284,901,000
1860–'61	1,472,000	3,850,000	1,058,000	6,380,000	1,112,500	5,267,500	2,212,350,000
1866–'67	1,426,700	2,319,000	2,601,000	6,346,700	1,172,000	5,174,700	1,893,940,000
1867–'68	1,172,000	2,600,000	2,550,000	6,322,000	651,400	5,670,600	2,094,105,000

While the number of *bales* consumed during the last year exceeds that of 1859–'60 (the largest previous to the year 1867–'68) by 387,600, the number of *pounds* consumed the last year was less than that of 1859–'60 by 190,896,000, equal to 518,000 bales of the average weight of the last year. This exhibits the falling off in the average weight of bales since the proportion of American supply fell from seven-eighths to one-half of the whole supply.

The consumption of cotton in Europe and the United States during the last year, 1867–'68, shows an increase upon the preceding year, 1866–'67, of 495,900 bales, or 200,165,000 pounds.

CHAPTER III.

COTTON MANUFACTURING IN THE UNITED STATES.

PROMINENT EVENTS IN THE HISTORY OF AMERICAN COTTON MANUFACTURE—STATISTICS OF MANUFACTURE—AVERAGES OF SPINDLES—RETURNS FROM COTTON MILLS—COMPARATIVE STATEMENT OF THE MOVEMENTS OF COTTON IN EUROPE AND THE UNITED STATES—CONCLUSION.

HISTORICAL NOTICE.

The time allowed for preparing this report is too short to permit writing a history of the early cotton manufacture in this country; nor can space be given for any proper treatment of a subject so interesting.

We pass over the period from 1620, when cotton was recommended for cultivation in Virginia as a useful material for textile fabrics, down to 1760–'80, when the inventions in England of spinning and other machines by Highs, Lees, Hargreaves, and Arkwright, gave a new value to and demand for cotton.

The spinning and weaving in the colonies during that time was chiefly of wool and flax, and only for home wear, trade in such manufactures being prohibited. Indeed, the history of that period tells of the policy and laws of the mother country toward the colonies, interdicting or repressing such industries as might compete with the manufacturer at home or lessen his market.

For the brief narrative which follows, of the prominent events in the history of the American manufacture of cotton goods, we are mainly indebted to Samuel Batchelder, esq., of Boston, who was a practical manufacturer at New Ipswich, N. H., as early as 1808, and, though far advanced in years, still successfully directs the operations of one of the large corporations at Lawrence, Mass.

In 1863, Mr. Batchelder published a small book[1] containing such particulars of the history of the cotton manufacture in this country as he had collected, guided by the personal recollections of himself and his early cotemporaries, which reached back almost to the time of Slater and the introduction of the first Arkwright machines.

Spinning jennies and frames were put in operation in the United States very soon after they were started in England. Soon after the close of the war of the Revolution, in 1786–'87, the legislature of Massachusetts offered premiums for the introduction and setting up of manufacturing machinery. In 1789, the "Beverly Manufacturing Com-

[1] Introduction and Early Progress of the Cotton Manufacture in the United States. Boston: Little, Brown & Co. 1863.

pany" was incorporated, whose works at Beverly, Mass., had been begun in 1787, and were in operation there at the time of Washington's visit in 1789—the first cotton factory in America.

About the same time, Tench Coxe and others were actively promoting manufacturing operations in Pennsylvania. Machinery for making cotton goods was set up in Connecticut in 1790, in New Jersey in 1792, and in New York in 1794.

But Rhode Island was especially fortunate in securing the services of Samuel Slater, a practical machinist and manufacturer, who arrived from England near the close of the year 1789, and was soon employed by Moses Brown and Almy & Brown to take charge of their mills at Providence and Pawtucket.

The mills which had been started at Beverly, Providence, Paterson, (New Jersey,) and Philadelphia, had the spinning jenny; but it was Slater who first introduced Arkwright's machinery.

Thenceforward there was success, with rapid improvement, especially in Rhode Island and Massachusetts, attributable in a great degree to the skill and teaching of Slater.

Coxe's report upon the census of 1810 gives the number of cotton factories in the country as follows:

Maine	3	Pennsylvania	64
New Hampshire	12	Delaware	3
Massachusetts	54	Maryland	11
Vermont	1	Ohio	2
Rhode Island	28	Kentucky	15
Connecticut	14	Tennessee	4
New York	26		
New Jersey	4	Total	241

The number of spindles is not fully stated, but those of New Hampshire were less than 500 per mill, and in Rhode Island and Massachusetts less than 800 to each mill. The mills in the middle and western States were doubtless smaller still. Assuming the average of all at 400 per mill, the whole number of spindles would be 96,400.[1] (In Woodbury's report to Congress, in 1836, the number for 1810 was stated at 87,000.)

[1] Tench Coxe, in his "Statement of the Arts and Manufactures of the United States of America for the year 1810," (prepared in 1812, under instruction of Albert Gallatin, Secretary of the Treasury,) says "the maximum of our exportation of cotton in any one year was sixty-four millions of pounds weight;" that it was "worth then 12½ cents per pound at the planters' estates—$8,000,000;" and that if the 64,000,000 pounds of cotton could have been spun into yarn, (it would have required 1,160,000 spindles,) the weight of yarn would have been about 50,000,000 pounds, worth, at the price of the day, $1 12½ per pound, and its value "would amount to $50,000,000, exceeding the aggregate value of all the exports of American articles in the most favorable year." He further says, that by weaving this quantity of yarn into cloth it would become worth $67,000,000, and by the process of printing and dyeing, its value would be further increased, so that "the aggregate value of our sur-

The embarrassments to commerce growing out of the war in Europe, the Berlin and Milan decrees, orders in council, and our own embargo upon trade, had, prior to 1810, restricted the importation of foreign goods; and the consequent advance in prices gave impulse to a rapid increase in the production of such fabrics as could be manufactured here, particularly of cotton, to take the place of the foreign goods.

Mr. Batchelder, who was then making cotton goods, says, "The war with Great Britain in 1812 raised the price of goods to such extravagant rates that articles of cotton, such as had been previously imported from England at 17 to 20 cents per yard, were sold by the package at 75 cents. This state of affairs caused a further large increase of the manufacturing business during the war.

In 1811, Mr. Nathan Appleton[1] and Mr. Francis C. Lowell, of Boston, having met in Edinburgh, determined upon plans for the introduction to this country of the power-loom, then recently put in operation in some of the cotton mills in Great Britain. Those plans were carried into effect by Messrs. Lowell, Appleton, Patrick T. Jackson, and others, and power-loom weaving was successfully established in Waltham, Massachusetts, in 1814.

Improvements to the machinery for spinning and weaving, for card ing and dressing, and other processes in cotton manufacture were discovered and applied in rapid succession by the ready invention of Paul Moody and others. These, brought into use by the enterprise and sagacity of Mr. Lowell and his associates at Waltham, gave, in the vicinity of Boston, an impulse which for its day was as valuable and effective as that given by Slater and his associates in the vicinity of Providence at an earlier date. The later one was a great advance upon the first, yet the value of either to the welfare of the whole country cannot well be over-estimated.[2]

With the return of peace in 1815 the importation of foreign goods was resumed. The sudden fall in prices which followed was destructive of all profit in manufacturing operations, and brought ruin to many who were engaged in them.

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plus cotton, (64,000,000 pounds,) even when thus simply manufactured, would be raised from \$8,000,000 or \$9,000,000 to \$75,000,000."

The supplementary observations of Mr. Coxe, bearing date September, 1814, "*in regard to the uses of steam*" as applied to the manufactures of cotton and other materials, to "*the moving of boats and vessels freighted with those raw materials*," and other labor-saving devices, are peculiarly interesting now.

[1] See Memoir of Hon. Nathan Appleton, prepared for the Massachusetts Historical Society by Hon. R. C. Winthrop, for interesting particulars concerning the establishment of the earlier factories, introduction of the power-loom, &c.

[2] Mr. Nathan Appleton, in the sketches of his own life, which he had drawn up about the year 1855, and handed to Mr. Winthrop a short time before his death in 1861, thus wrote of the labor-saving machinery in the arrangement adopted by Mr. Lowell for the mill at Waltham prior to 1816. "It is remarkable how few changes, in this respect, have since been made from those established by him in the first mill built in Waltham."

REPORT OF THE CONGRESSIONAL COMMITTEE IN 1815.

A report of a committee of Congress in 1815 gave the following as the statistics of the cotton manufacture in the United States at that date.

Capital employed		$40,000,000
Operatives employed:		
Men	10,000	
Boys	24,000	
Women and girls	66,000	
		100,000
Wages of the 100,000, at $1 50 per week, average		$15,000,000[1]
Cotton consumed per year, 90,000 bales ... lbs..		27,000,000
Yards of cloth produced		81,000,000
Cost, averaging 30 cents per yard		$24,300,000

A statement of the spindles in three States was made as a basis for assessments to pay the expenses of an agent at Washington. It appears to have been carefully and correctly made up, and was as follows:

	Mills.	Spindles.
Rhode Island	99	68,142
Massachusetts	52	39,468
Connecticut	14	11,700
Total	165	119,310

The foregoing statistics of 27,000,000 pounds of cotton used, producing 81,000,000 yards of cloth, or three yards of yard-wide cloth per pound of cotton, indicate an average of about No. 15 yarn. At the probable rate of that day, there should have been about 350,000 spindles in the United States to consume the 27,000,000 pounds of cotton.

Up to this time (1815) the cotton machinery had been employed only in the production of yarn, which was woven upon hand looms, (the mill at Waltham, having power looms, being a recent exception.) Now came the necessity for adopting whatever would cheapen the process yet improve the product, and power looms soon came into general use.

The great profits of the owners of cotton factories for a few years prior to 1813, and the desire to participate in them, led to the erection of new mills and their machinery, to a great extent, upon credit. Many had not the capital, which would have been required in ordinary times for a proper conduct of the business, and had ventured without it under the temptation of extraordinary prices. While all suffered, these were utterly disabled by the change that came with peace.

All this large interest was prostrate. In the "Autobiographical Sketches" left by Nathan Appleton, he made notes of a visit which he and Mr. Lowell made to Rhode Island in 1816. He says: "We proceeded to Pawtucket. We called on Mr. Wilkinson, the maker of

[1] Should be $150,000.

machinery. He took us into his establishment—a large one. All was silent—not a wheel in motion—not a man to be seen. He informed us that there was not a spindle running in Pawtucket, except a few in Slater's old mill, making yarns; all was dead and still. * * * We saw several manufacturers; they were all sad and despairing."

Congress was petitioned for relief in the form of a protective tariff, and the policy of encouraging American industry in this way was earnestly advocated and carried by Calhoun, Clay, and other leading southern men in Congress, against the strenuous resistance of representatives from the New England and other districts largely interested in shipping and foreign commerce.

The recovery from this extreme depression was slow and gradual. Adversity had compelled the adoption of the best labor-saving machinery which ingenious men could devise, and a resort to all the wise economies that should tend to cheapen the cost of production. Under favor of these benefits and the fostering effect of the protective tariff the manufacturing interest regained a profitable position, and began a new period of growth and prosperity. It has since passed through adverse times, making losses and encountering changes of legislative policy that were discouraging; but in spite of these and their checks to progress, it has increased from one decade to another, and has become one of the most important, as it is one of the most firmly established industries of our people.

In 1821 Messrs. Nathan Appleton, Kirk Boott, P. T. Jackson, and Paul Moody started the improvement of the water-power on the Merrimack river, which created the city of Lowell. It was the origin and type of the many great manufacturing towns which have become the seats of wealth-producing power.

Our limited time and space do not permit even a chronological statement in detail of the beginning and progress of the large manufacturing works at Saco, Biddeford, and Lewiston, in Maine; at Great Falls, Salmon Falls, Manchester, and Nashua, in New Hampshire; at Lawrence, Fall River, and the hundred other manufacturing cities and towns in Massachusetts; nor of the extension of this business in the States of Rhode Island and Connecticut, dotting them all over with factories wherever a water-power could be utilized under the influences which began with and flowed from the success of Slater in 1789–'90.

The early, persistent, and successful efforts for the promotion of manufactures in Pennsylvania, New Jersey, and New York, and the results achieved, deserve special mention, but, like the others, must be passed over.

STATISTICS OF MANUFACTURE.

It remains now to present such statistics as are obtainable to show the growth of this business from one decade to another and its present condition.

The following table is made from the data gathered and presented to Congress by Mr. Woodbury in his special report, March 4, 1836. Few, if any, of its quantities could have been taken from actual returns, and all are more or less the subjects of estimate. (The spindles in 1815 must have been over 300,000.) Mr. Woodbury explains that the quantities of cotton stated as consumed included the cotton used in families for home spinning and all other purposes.

Number of spindles and consumption of cotton from 1805 to 1835 inclusive, according to Woodbury.

Year.	Number of spindles.	Pounds of cotton used.	Year.	Number of spindles.	Pounds of cotton used.
1805	4,500	11,000,000	1821	230,000	50,000,000
1807	8,000	....	1825	800,000	....
1809	31,000	....	1828	1,250,000	60,000,000
1810	87,000	16,000,000	1830	1,500,000	....
1811	80,000	17,000,000	1831	....	77,500,000
1814	122,646	....	1833	....	82,500,000
1815	130,000	31,500,000	1835	1,750,000	100,000,000
1820	220,000	....			

CENSUS RETURNS.

The following table of statistics was compiled from the census returns of 1840. The number of cotton mills then returned exceeds the number now in existence. Either many have been discontinued, or some were included then that were not properly *cotton* factories.

It will be noticed that there were no cotton mills in the States of Illinois, Missouri, Michigan, Florida, Wisconsin, Iowa, nor in the District of Columbia.

Statistics of the cotton manufacture of the United States according to the census returns of 1840.

States.	Number of mills.	Number of spindles.	Dyeing and printing establishments.	Value of product.	Numb r of persons employed.	Capital.
Maine	6	29,736	3	$970,397	1,414	$1,398,000
New Hampshire	58	195,173	4	4,142,304	6,991	5,523,200
Massachusetts	278	665,095	22	16,553,423	20,928	17,414,099
Rhode Island	209	518,817	17	7,116,792	12,086	7,326,000
Connecticut	116	181,319	6	2,715,964	5,153	3,152,000
Vermont	7	7,254	......	113,000	262	118,100
New York	117	211,659	12	3,640,237	7,407	4,900,772
New Jersey	43	63,744	13	2,086,104	2,408	1,722,810
Pennsylvania	106	146,494	40	5,013,007	5,522	3,325,400
Delaware	11	24,492	......	332,272	566	330,500
Maryland	21	41,182	3	1,150,580	2,284	1,304,400

Statistics of the cotton manufacture, &c.—Continued.

States.	Number of mills.	Number of spindles.	Dyeing and printing establishments.	Value of product.	Number of persons employed.	Capital.
Virginia	22	42, 262	1	446, 063	1, 816	1, 299, 020
North Carolina	25	47, 934	......	438, 900	1, 219	995, 300
South Carolina	15	16, 355	......	359, 000	570	617, 450
Georgia	19	42, 589	2	304, 342	779	573, 835
Alabama	14	1, 502	......	17, 547	82	35, 575
Mississippi*	53	318	......	1, 744	81*	6, 420
Louisiana	2	706	......	18, 900	23	22, 000
Tennessee	38	16, 813	......	325, 719	1, 542	463, 240
Kentucky	58	12, 358	5	329, 380	523	316, 113
Ohio	8	13, 754	......	139, 378	246	113, 500
Indiana	12	4, 985	1	135 400	210	142, 500
Arkansas	2	90	......	....	7	2, 125
Total	1, 240	2, 284, 631	129	46, 350, 453	72, 119	51, 102, 359

* Evidently erroneous; probably three mills, and eighteen persons employed.

The report of the seventh United States census (for 1850) does not mention cotton mills or spindles. Its statistics of the cotton manufacture specify the capital employed, value of the production, number of persons employed, and some other items of information that would be useful if they were reliable. It fails to supply the details necessary to a comparision of the cotton manufacture in 1850 with that of 1840 and 1860.

In a compendium of the seventh census, prepared by J. D. B. DeBow in 1854, are to be found some statistics that were omitted in the large quarto report. Some of these are included in Table 196 in the compendium, upon "cotton manufactures, 1850." Still the table,[1] like the census report, omits mention of the cotton spindles, and as an exhibit of the manufacturing capacity of the cotton mills in the several States is very unsatisfactory and inaccurate. The number of mills in Rhode Island, their capital and their product, are set down as less in 1850 than they were by the census of 1840, when, in fact, there had been a large increase.

According to the annual cotton crop statement, published by the New York Shipping List for the year 1849–'50, the total quantity of cotton taken for home consumption that year was 613,000 bales, for all uses, north and south, of which not more than 600,000 bales could have been consumed by the spinning machinery. DeBow's table states the con-

[1] The table referred to is copied (without credit, however) into the Supplement on Cotton Statistics and Manufactures, by P. L. Simmonds, appended to the edition of Ure's Cotton Manufactures of Great Britain, published by Bohn, London, 1861. Our country should supply more carefully prepared statistics for use in the preparation of works so valuable as those of Ure and Simmonds. (See Vol. 1, page 436.)

sumption of cotton at 641,240 bales, and so placed in the table as to bear the inference that it was consumed in the mills. If the cotton used in families for all purposes was included, then it would be nearer the right quantity.

AVERAGES OF CONSUMPTION, SPINDLES, AND YARN.

Through the well-directed efforts of the "National Association of Cotton Manufacturers and Planters," during the past year, some data have been obtained that are reliable and valuable as supplying a basis for computations of past as well as present and future quantities. In another place we shall make free use of their tables.

For the present these facts should be noted:

The present average annual consumption of cotton in all the United States is at the rate of 65 pounds per spindle; in the northern States the rate is 60.7 pounds, and in the southern States it is 138.12 pounds per spindle.

The average size or number of yarn produced is as follows: In the United States, 27½, in the north 28, in the south 12⅞.

There is a constant tendency to finer work as labor becomes more skilled and raw material more costly in proportion. Down to within a few years the number of yarn was as coarse as No. 14 in a large part of the northern production.

The average now being 27½, it cannot be far wrong to place the average size of yarn for 1860, No. 23; for 1850, No. 22½; for 1840, No. 20.

The consumption of 65 pounds of cotton per year to each spindle, for an average of No. 27½ yarn, after allowing 20 per cent. gross waste, produces 52 pounds of yarn, equal to 1,430 hanks, which, for 300 working days, gives 4.76 hanks per day.

The better machinery now affords a higher rate of production than was generally practicable for the same yarn in the same time some years ago.

The coarser the yarn on equal speed, the greater will be the quantity of cotton used.

Comparing the work in 1850 with that now done, it will be well to assume, in the absence of stated facts, that in the year 1850 the average number of yarn was 22½; the average rate, 4.8 hanks per day; the cotton consumed in mills, 600,000 bales, equal to 264,000,000 pounds; which, at 80 pounds per year for each spindle, would require 3,300,000 spindles to work it up.

Mr. Samuel Batchelder made a report to the Boston board of trade in 1861, upon the cotton manufacture, in which, by another process, he arrived at a result not widely different.

DEFECTIVE STATISTICS.

The errors in DeBow's compendium of the United States census for 1850 have been noticed. As the statistical work by the same compiler, J. D. B. DeBow, entitled "The Industrial Resources, &c., of the Southern and Western States," is often cited as good authority in matters per-

taining to cotton, its trade, and manufacture, it is well to say here, and show reason for saying, that its statistics generally in regard to manufactures of cotton are quite erroneous, and not to be accepted until verified.[1]

In volume 1, page 210, he says: "In 1840 the cotton used annually in our mills was 106,000,000 pounds; capital invested was [1] $80,000,000; annual value of cotton manufacture [2] $60,000,000. In the same year there were in operation in the New England States 1,590,140 spindles. The whole number of cotton spindles in the United States in 1850 was 2,500,000, showing an increase of 20 per cent. in the last ten years, [3.] Of the present actual condition of the cotton manufacture in this country we cannot speak with entire certainty until the returns of the census for 1850 are published. We are deficient in details, but for the figures given above, derived chiefly from a work on American cotton manufactures by Robert H. Baird, 1851, we can speak with confidence of the 2,500,000 [4] cotton spindles now in the United States; 150,000 are in the southern States and 100,000 in the western."

The foregoing is a literal quotation.

(1.) The census of 1840 stated the capital at $51,102,359.

(2.) The census of 1840 stated the annual product at $46,350,453.

(3.) Although the census of 1840 is not mentioned, and in other particulars its statistics are displaced by his own, here Mr. DeBow refers to the number of spindles in the census of 1840, upon which there is an increase of 20 per cent.

(4.) There is nothing but bare assertion for the 2,500,000 spindles in 1850. See its contradiction by himself below.

From page 220 of the same volume is quoted: "The following returns, based partly on the official census, show the number of mills and spindles in each of the New England States using cotton wholly, leaving out all of those engaged in the manufacture of warps for satinets, merino shirts, mousselaine delaines, and shawls of mixed materials, of which it forms a component part:

"*Mills, spindles, and looms in New England.*

States.	Mills.	Looms.	Spindles.	
			1850.	1840.
Maine	15	3, 439	113, 900	29, 736
New Hampshire	40	12, 462	440, 401	195, 173
Massachusetts	165	32, 655	1, 288, 091	665, 095
Vermont	12	345	31, 736	7, 254
Rhode Island	166	28, 233	624, 138	518, 817
Connecticut	109	6, 506	252, 812	181, 319
Total	507	* 82, 640	† 2, 754, 078	1, 597, 304

* The clerical errors in the footings follow the original.

† Here we see 2,754,078 spindles for New England alone, whereas in the statistics which he "could use with confidence," Mr. DeBow stated the number to be 2,500,000 for all the United States.

[1] See Appendix K for another of Mr. DeBow's tables of cotton statistics.

"This shows a very considerable increase of production; being nearly 90 per cent. in the number of spindles."

That there was no proper statement of the cotton manufacture in 1850, was attributable to Mr. DeBow, who had charge of the census statistics. He should have all the credit due to his work.

Statistics of the cotton manufacture in the United States for the year ending June 1, 1860; (from the eighth U. S. Census Report, by J. G. C. Kennedy.)

States.	No. of mills.	No. of spindles.	No. of looms.	Capital invested.	Pounds of cotton used.	Value of raw material.	No. persons employed.	Cost of labor.	Value of product.
Maine	19	300,000	6,000	$6,108,325	23,438,723	$3,000,000	6,250	$1,244,928	$6,636,623
New Hampshire	44	669,885	17,015	13,878,000	39,212,644	9,758,921	20,159	4,574,520	16,661,531
Vermont	10	19,712	424	321,000	1,057,250	133,000	367	78,468	357,400
Massachusetts	200	1,739,700	44,978	33,300,000	126,666,089	14,778,344	34,988	7,221,156	36,745,864
Rhode Island	135	766,000	26,000	11,500,000	38,521,668	5,281,000	12,089	2,417,640	12,258,657
Connecticut	64	464,000	8,787	6,000,000	15,799,140	4,000,000	7,589	1,453,128	7,641,460
New York	70	328,816	7,511	5,427,079	25,910,876	2,988,270	7,331	1,271,592	7,471,961
Pennsylvania	151	358,578	10,678	8,253,640	32,855,669	6,732,275	12,720	2,265,912	11,759,000
New Jersey	29	96,112	1,181	1,845,000	2,257,885	1,693,663	2,224	435,684	3,250,770
Delaware	11	25,704	494	572,000	2,717,000	521,492	1,007	202,884	919,103
Maryland	19	49,891	1,520	2,214,500	12,020,119	1,641,913	2,515	464,112	2,796,877
District of Columbia	1	2,560	82	45,000	294,117	47,403	95	19,800	74,400
Ohio	7	15,000	400	250,000	1,815,000	250,000	610	112,400	629,500
Indiana	2	11,000	375	250,000	800,000	100,000	366	72,468	349,000
Illinois	3	....	....	10,000	40,000	8,000	16	1,980	15,987
Missouri	3	14,500	....	169,000	100,000	14,500	170	31,080	230,000
Kentucky	4	9,500	....	104,000	311,000	139,000	146	21,000	167,500
Virginia	13	28,700	524	1,325,243	7,302,797	770,977	1,693	262,440	1,063,611
North Carolina	36	30,144	479	1,049,750	5,152,750	564,612	1,626	168,840	930,567
South Carolina	17	16,461	931	827,825	3,845,811	419,500	956	132,180	588,950
Georgia	32	44,312	1,058	1,854,603	12,977,904	1,689,075	3,285	482,520	2,215,636
Florida	1	....	....	30,000	200,000	22,000	65	7,872	40,000
Alabama	11	28,540	663	1,306,500	4,389,641	623,963	1,332	206,124	917,105
Louisiana	2	4,225	150	1,075,000	1,995,700	283,900	140	24,000	509,700
Texas	1	2,700	100	500,000	588,000	78,920	160	36,480	99,241
Mississippi	4	1,844	28	350,000	534,400	163,419	310	33,996	261,135
Arkansas	1	....	....	55,000	60,000	6,750	30	7,200	13,000
Tennessee	25	7,914	80	930,000	3,172,000	283,838	681	109,764	533,348
Totals	915	5,035,798	129,458	99,551,465	364,036,123	55,994,735	118,920	23,380,168	115,137,926

From the foregoing table appear the following averages per spindle in most of the States:

Averages per spindle according to the table,

States.	Capital invested.	Pounds cotton consumed.	Product.	Value per lb. of raw material.
Maine	$20 36	78. 13	$22 12	$0 12½
New Hampshire	20 71	58. 52	24 87	25
Vermont	16 30	56. 20	18 13	12¼
Massachusetts	19 14	72. 81	21. 12	11¼
Rhode Island	15 00	50. 30	16 00	13¾
Connecticut	12 93	34. 05	16 47	25¼
New York	16 50	79. 11	22 73	11¼
Pennsylvania	23 00	91. 60	32 79	20½
* New Jersey	19 20	23. 49	33 83	75
Delaware	22 25	105. 72	35 76	19½
Maryland	44 38	240. 92	56 05	13¾
Ohio	16 67	121. 00	41 97	13½
Indiana	22 73	72. 72	31 73	12¼
Missouri	11 65	6. 89	15 86	14¼
Kentucky	10 95	32. 74	17 63	44¼
Virginia	46 18	257. 93	37 06	10¼
North Carolina	34 82	170. 93	30 87	11
South Carolina	50 29	233. 63	35 17	11
Georgia	41 85	292. 87	50 00	13
Alabama	45 77	153. 80	32 13	14½

* The light quantity of cotton consumed and large value per pound of the raw material in New Jersey indicates thread spinning and the use of sea island and other costly cotton. This is confirmed by the small number of looms.

The Preliminary Report on the Eighth Census, by J. G. C. Kennedy, superintendent, says of the facts exhibited in the foregoing census table:

"The product per spindle varies in the different States, partly accounted for by the fact that many manufacturers purchase yarns which have been spun in other States. * * * * The quantity of cotton used in the fabrication of the above goods was 364,036,123 pounds, or 910,000 bales of 400 pounds each. Of this amount the New England States consumed 611,738 bales, and Massachusetts alone 316,655. The consumption per spindle in that year in the various sections was as follows:

Consumption of cotton per spindle.

	No. of spindles.	Pounds of cotton.	Pounds per spindle.
In New England	3, 959, 297	237, 844, 854	61. 8
In the middle States	861, 661	76, 055, 666	88. 26
*In the southern States	174, 340	40, 530, 003	232. 48
In the United States	5, 035, 798	364, 036, 123	72. 2

* We have interpolated this line showing in a separate aggregate the spindles and consumption of the southern States (south of the Potomac) from the census table. The cotton consumed must include cotton used in families, or otherwise than upon mill spindles, the utmost capacity of which would be equal to the consumption of a quantity only about half as large as the above rate per spindle.

STATISTICS FROM THE NATIONAL ASSOCIATION OF COTTON MANUFACTURERS AND PLANTERS.

Allusion has been made to the publications of the "National Association of Cotton Manufacturers and Planters." That association was organized in the early part of the last year, chiefly "to promote the cultivation of cotton in our country, and a recognition of the identity of interests between the cotton planters and manufacturers; and generally to accomplish by associated efforts whatever may be for the common good within the sphere of the association, shunning everything of a local or partial character."

By the courtesy of the officers of that association we are permitted to take the following table and remarks from a report prepared by its statistical committee, to be presented at an approaching meeting to be held in Baltimore.

The table is compiled from the actual returns made from the mills, in number and locality as stated, and these carefully collected by the secretary of the association. The number of spindles is less than 7,000,000.[1]

Synopsis of returns from cotton mills, January 30, 1869.[2]

States.	Mills.	Spindles.	Average number of yarn.	Cotton spun.	Average per spindle.	Cotton otherwise used.
				Pounds.	*Pounds.*	*Pounds.*
Maine	22	443, 800	24⅓	28, 838, 608	65	....
New Hampshire	49	734, 460	25½	48, 089, 439	65. 46	1, 297, 600
Vermont	16	28, 038	29½	1, 281, 125	45. 69	953, 500
Massachusetts	150	2, 386, 002	27¼	138, 081, 144	57, 87	197, 000
Rhode Island	126	1, 082, 376	35½	51, 938, 373	47, 06	890, 800
Connecticut	61	545, 528	29	31, 652, 920	58	492, 500
New York	88	437, 482	32½	22, 097, 044	50. 51	4, 125, 000
New Jersey	30	175, 042	32¾	10, 767, 600	61. 51	7, 000
Pennsylvania	71	384, 828	17	34, 806, 531	90. 45	2, 336, 500
Delaware	9	48, 892	21	3, 286, 280	67. 46	....
Maryland	11	45, 502	12¾	7, 972, 896	175. 22	....
Ohio	5	22, 834	13	3, 170, 000	138. 82	600, 000
Indiana	1	10, 800	14	1, 493, 061	138. 26	....
Illinois	1	....	......	....	....	126, 500
Missouri	4	13, 436	10	2, 475, 000	184. 21	....
Northern	664	6, 359, 020	28	385, 952, 021	60. 7	11, 026, 400
Virginia	10	36, 060	15½	4, 010, 000	111. 18	....
North Carolina	17	24, 249	10½	3, 537, 000	145. 85	....
South Carolina	6	31, 588	13½	4, 174, 100	132. 14	....
Georgia	20	69, 782	12¾	10, 864, 350	155. 70	....
Alabama	8	25, 196	17	2, 820, 596	112	....

[1] See appendix (F) for the report upon cotton spinning in the United States, as made by the international jury of the Paris Exposition, 1867.

[2] From the records of the National Association of Cotton Manufacturers and Planters.

Synopsis of returns from cotton mills, January 30, 1869—Continued.

States.	Mills.	Spindles.	Average number of yarn.	Cotton spun.	Average per spindle.	Cotton otherwise used.
Mississippi	6	8, 752	9	1, 457, 000	166. 48	....
Texas	4	8, 528	9¼	1, 372, 104	160. 90	....
Arkansas	2	924	8½	258, 400	268. 83	....
Tennessee	10	13, 720	10	1, 847, 200	134	....
Kentucky	3	6, 264	10	1, 075, 000	171. 62	....
Southern	86	225, 063	12¾	31, 415, 750	138. 12	....
Northern States	664	6, 359, 020	28	385, 952, 021	60. 70	11, 026, 400
Southern States	86	225, 063	12¾	31, 415, 750	138. 12	....
Total	750	6, 584, 083	27½	417, 367, 771	64. 88	11, 026, 400

There are not probably more than 100 mills nor more than 250,000 spindles in the country not yet returned.

The secretary has upon his list only 81 mills unreported, in which he estimates that there are 233,000 spindles. This list includes all of which he can get any mention whatever.

In explanation of the greater number of mills (1,091) reported in the census of 1860, he submits the following:

Mills of which he has returns		750
Mills on his list not returned		81
Mills originally on his list not now using cotton:		
That have ceased running	72	
Consolidated with others	14	
Printing only	11	
Weaving only	75	
Using waste from other mills	10	
	=	182
Total		1, 013

It is probable that many factories were classed as cotton mills in the census of 1860, which would be excluded by us as not properly cotton-spinning mills. The secretary finds that cotton in considerable quantities is "used otherwise than in cotton-spinning." He is trying to get complete returns of it, but finds obstacles not easily overcome, and is satisfied that the partial returns stated in the column for "cotton not otherwise used" do not represent one half the proper quantity.

The mills reporting which spin cotton use per year	417, 367, 771 pounds.
Eighty-one mills not reporting are estimated to use	27, 960, 000 pounds.
Cotton otherwise used, that is, for textile fabrics, batting, &c., but not in cotton mills proper, estimated at....................................	24, 672, 229 pounds.
	470, 000, 000 pounds.
Deduct, for the exceptional cases in which the quantity reported is the usual consuming capacity, and not the actual consumption of the year	20, 000, 000 pounds.
Total consumption for 1868, (in part estimated, as above)..................................	450, 000, 000 pounds.
Of which was used in the southern States, about.	38, 000, 000 pounds.

INCREASE OF MANUFACTURED GOODS.

The sum of the increase of the manufacture of cotton goods and yarns in the United States is shown approximately in the following recapitulation of the aggregates at the decennial periods:

Sum of increase of the manufacture of cotton goods.

Year.	No. of mills.	No. of spindles.	Pounds cotton consumed.	Average per spindle.	Average No. of yarn.
1840	1, 240	2, 284, 631	171, 201, 218	74. 94	20
1850	....	3, 300, 000	264, 000, 000	80.	22½
1860	915	5, 035, 798	364, 036, 123	72. 2	23
1868	831	6, 817, 083	450, 000, 000	64. 88	27½

The rate of increase thus appears to have been—

1840 to 1850...in spindles 44.4 per cent....in cotton used 54.2 per cent.
1850 to 1860...in spindles 52.6 per cent....in cotton used 37.9 per cent.
1860 to 1868...in spindles 35.4 per cent....in cotton used 23.6 per cent.
1840 to 1868..in spindles 198.3 per cent...in cotton used 162.8 per cent.

We do not find any complete statistics of the various kinds of cotton goods produced. The custom-house returns afford some materials for a table of cotton goods exported, which table will be found in the appendix, (E,) embracing, however, only plain white or brown goods, and only from the ports of New York and Boston for the years 1849 to 1868, inclusive. This table shows nearly the whole export of domestic cottons, and in a comparison of the several years the fluctuations of increase and diminution may be observed. In the appendices (D) and (H) will be found a table containing the principal facts of the British trade and manufac-

ture of cotton. The statement for the calendar year 1868, in Great Britain, stands thus:[1]

Imports, exports, and consumption in Great Britain, 1868.

	Bales.	Pounds.
Stock held by spinners January 1	80,000	30,253,000
Stock in the ports January 1	554,800	191,415,360
Import during the year	3,660,130	1,296,957,930
Total supply	4,294,930	1,518,625,290
Export during the year	915,120	315,195,100
Stocks held by spinners December 31	80,000	28,953,000
Stocks in the ports December 31	497,870	178,280,090
Total deduction	1,492,990	522,428,190
Leaving as the actual consumption	2,801,940	996,197,100

Which compares as follows with the preceding nine years:

Year.	Bales.	Pounds.	Year.	Bales.	Pounds.
1868	2,801,940	996,197,100	1863	1,303,500	476,445,000
1867	2,552,498	954,517,505	1862	1,185,500	449,821,000
1866	2,406,394	890,721,031	1861	2,363,600	1,005,477,000
1865	2,034,730	718,651,000	1860	2,523,000	1,079,321,000
1864	1,566,400	561,196,000	1859	2,296,700	977,633,000

In order to give a correct comparison of the amount of cotton consumed in each of the past ten years, we have reduced the bales to the uniform weight of 400 pounds each, as follows:

Amount of cotton consumed, 1859 to 1868.

Year.	Total in bales of 400 pounds.	Average per week.	Years.	Total in bales of 400 pounds.	Average per week.
1868	2,490,490	47,890	1863	1,191,110	22,910
1867	2,386,290	45,890	1862	1,124,550	21,620
1866	2,226,800	42,820	1861	2,563,690	49,300
1865	1,796,639	34,550	1860	2,698,300	51,890
1864	1,402,990	26,980	1859	2,444,080	47,000

As compared with 1867, the consumption of 1868 shows an increase of only 2,000 bales of 400 pounds per week.

In Simmonds's statistical supplement to Ure's Cotton Manufacture of

[1] From Ellison & Haywood's Annual Review, for the year 1868, published in Liverpool January 14, 1869.

Great Britain, London, 1861, page 397, the items of the following table are found:

Year.	Pounds cotton consumed.	No. of persons employed in cotton mills.	No. of spindles.	Average weight of cotton consumed per spindle.
1856	891, 400, 000	379, 213	28, 010, 217	31¾ pounds.
1859	976, 600, 000	415, 423	30, 759, 368	31¾ pounds.
1860	1, 050, 895, 000	446, 999	33, 099, 056	31¾ pounds.

A parliamentary return stated that there were in Great Britain, in 1850, 20,858,062 spindles, consuming 629,798,400 pounds cotton, equal to 30 pounds per spindle.

The increase of cotton spindles in Great Britain since 1860 is estimated to exceed 10 per cent. If now only 36,500,000 in number, and using the same number of pounds of cotton per spindle when fully employed, as in 1859–'60, they would require about 1,159,000,000 pounds. The quantity used in 1868, 996,197,000 pounds, was only about 85 per cent. of the quantity required for the machinery to run full.

The following very interesting statistics of European cotton trade and manufacture are derived from the Annual Review of Messrs. Ellison & Haywood, of Liverpool, who give credit for some of the *continental* figures to Messrs. Stolterfoht, Sons & Co.:

A comparative statement of the movements of cotton in Europe and the United States, 1868, 1867, 1866, *and* 1860.

Countries.	Import—bales.				Total yearly deliveries for consumption—bales.			
	1868.	1867.	1866.	1860.	1868.	1867.	1866.	1860.
Great Britain, (less export)	2,745,000	2,486,000	2,612,000	2,758,000	2,804,000	2,512,000	2,436,000	2,633,000
France	714,000	551,000	688,000	728,000	696,000	608,000	614,000	621,000
Holland	162,000	145,000	186,000	310,000	162,000	141,000	184,000	117,000
Belgium	103,000	45,000	72,000	56,000	103,000	45,000	72,000	64,000
Germany	459,000	394,000	409,000	305,000	477,000	371,000	403,000	307,000
Trieste	88,000	84,000	52,000	83,000	93,000	79,000	51,000	77,000
Genoa	25,000	22,000	17,000	94,000	25,000	23,000	15,000	72,000
Spain	159,000	140,000	132,000	156,000	161,000	138,000	127,000	106,000
Russia, &c	295,000	346,000	294,000	278,000	295,000	346,000	294,000	324,000
Total for Europe	4,750,000	4,213,000	4,462,000	4,768,000	4,816,000	4,263,000	4,196,000	4,321,000
United States, (north)[1]					819,000	723,000	667,000	860,000
Total Europe and America					5,635,000	4,986,000	4,863,000	5,181,000

[1] The figures for the United States are for the seasons ended August 31, except as regards the stocks, which are the quantities on hand at the close of the year.—[E. & H. Review.]

A comparative statement of the movements of cotton, &c.—Continued.

Countries.	Deliveries for consumption.								Stock in the ports Dec. 31—bales.		
	Weekly averages—bales.				Yearly totals, in millions of pounds.						
	1868.	1867.	1866.	1860.	1868.	1867.	1866.	1860.	1868.	1867.	1860.
Great Britain	53, 880	48, 317	46, 885	50, 633	985. 5	939. 3	915. 7	1, 126. 9	497, 000	554, 000	595, 000
France	13, 384	11, 692	11, 808	11, 942	249. 8	218. 3	218. 8	269. 7	80, 000	62, 000	105, 000
Holland	3, 115	2, 712	3, 538	2, 250	57. 3	50. 0	65. 4	48. 3	11, 000	11, 000	22, 000
Belgium	1, 960	866	1, 385	1, 231	37. 5	16. 4	25. 5	26. 5	....	....	2, 000
Germany	9, 173	7, 134	7, 750	5, 904	169. 3	131. 7	136. 9	127. 1	15, 000	33, 000	20, 000
Trieste	1, 798	1, 519	981	1, 492	34. 8	29. 6	18. 4	31. 7	2, 000	7, 000	10, 000
Genoa	480	442	288	1, 365	8. 7	8. 0	5. 3	31. 0	2, 000	2, 000	8, 000
Spain	3, 096	2, 654	2, 442	2, 039	48. 9	41. 9	38. 1	46. 4	9, 000	11, 000	20, 000
Russia, &c	5, 673	6, 654	5, 654	6, 211	98. 5	115. 6	100. 3	137. 1	....	....	....
Total for Europe	92, 569	81, 990	80, 731	83, 077	1, 690. 3	1, 550. 8	1, 524. 4	1, 844. 7	616, 000	680, 000	782, 000
United States, (north)[1]	15, 750	13, 900	12, 830	16, 540	362. 8	321. 0	294. 1	382. 7	312, 000	360, 000	629, 000
Total Europe and America	108, 319	95, 890	93, 561	99, 617	2, 053. 1	1, 871. 8	1, 818. 5	2, 227. 4	928, 000	1, 040, 000	1, 411, 000

[1] The figures for the United States are for the seasons ended August 31, except as regards the stocks, which are the quantities on hand at the close of the year.—[E. & H. Review.]

The deliveries to Great Britain in 1868 show a decrease of 343,500 bales (of average of 400 pounds each) compared with 1860, while those to Holland and Germany together show an increase of 128,000 bales of same weight. The absolute increase in the consumption of Great Britain in 1868 over 1867 was only a trifle over the increase in Germany, the figures being 115,000 and 112,000, respectively.

The aggregates for the several years in the foregoing table differ a little from those in our own comparative table on page 49, because the latter were computed for years ending 30th September in Europe and 31st August in the United States, while the former represent the results for the calendar years. (See Table II in the Appendix.)

CONCLUSION.

The experience of the past year fully justifies the conclusion stated in the report made from this commission in August, 1867. The peculiar advantages of our country for producing cotton are rapidly regaining the position held before the war—quite fast enough, in view of the extraordinary change in the condition of the laboring population and of the wastes by war.

The cotton-planting States should continue to produce, as of first necessity, ample supplies of food for home use. The power of high prices (the seasons being favorable) will not fail to secure a progressive increase in the production of cotton at a cost cheapening from year to year, until its excess shall at length drive from competition the cotton of less favored countries.

B. F. NOURSE, *Commissioner.*

BOSTON, *February* 1, 1869.

APPENDICES.

APPENDIX A.

CAPITAL INVESTED IN THE CULTURE OF COTTON IN 1835.

The following statement of the capital invested in the culture of cotton in 1835 is taken from "Woodbury's Tables and Notes on the Cultivation, Manufacture and Foreign Trade of Cotton"—a report to Congress March 4, 1836, before cited in this report.

"The crop of 1834–'35 was set down by the same authority, and correctly, at 460,000,000 pounds, which would be 230 pounds per acre on the area of land as stated below.

"The capital invested in cotton lands under cultivation at 2,000,000 acres, and worth, cleared, on an average, $20 per acre, is	$40,000,000
"The capital in field hands, and in other lands, stock, labor, &c., to feed and clothe them, at $100 per year, on 340,000 in number, would require the interest or income of a capital at 6 per cent. of..........	544,000,000
"The maintenance of 340,000 more assistants, &c., at $30 each per year, would require the income of a capital at six per cent. of..........	167,000,000
"The capital to supply enough interest or income to pay for tools, horses for ploughing cotton, taxes, medicines, overseers, &c., at $30 for the first 340,000, would be.....	167,000,000
"Making in all a permanent capital equal to	918,000,000"

Apply to this formula the quantities and values of 1860, and we should have a total capital of $2,682,000,000 employed in producing the crop of 1859–'60, allowing 240 pounds to the acre.

The capital now required for the production of 3,000,000 bales per annum, of 450 pounds each, is but little more than the value of about 8,000,000 acres of land, and buildings which at present values can hardly exceed $100,000,000, and so much more capital as would pay from its interest the wages and maintenance of laborers a few months until crops begin to come in. The latter portion of the required capital rests chiefly in the surplus of crops for subsistence carried forward from the previous harvest.

APPENDIX B.

THE AUGUSTA COTTON MANUFACTURING COMPANY OF AUGUSTA, GA.

It appears from the report of the president of the company, Mr. William E. Jackson, that the gross earnings of the company during the six months ending June 30, 1868, amounted to $135,510 65; interest received, $3,921 65; total, $139,432 30. The expenses and taxes for the same time were $31,898 16; leaving a net profit of $107,544 14. Two dividends amounting to $60,000 were paid, enabling the company to carry to the credit of profit and loss account $47,534 14, making the amount at present to that account, $224,798 22. The goods manufactured from December 14, 1867, to June 13, 1868, were, pounds, 1,184,845; pieces, 98,348; yards, 3,888,301. The cotton consumed amounted to 1,362,571 pounds; average cost of cotton, 19.98; the average number of yards per loom made daily was 49 1-5; number of looms running, 505; number of hands employed, 507; aggregate wages paid, $87,546 93; aggregate sales, $519,965 01. Between June 13, 1865, and June 30, 1868, the company increased its machinery to the extent of $92,686 76 worth, and paid to the stockholders $360,000. The company commenced business with a capital of $60,000. The gold value of their property on the 30th of June last, irrespective of the $224,798 22 before mentioned as standing to their credit, was $600,000. The aggregate sales of the company since their organization have amounted to $3,765,301 80; the wages paid to $622,280 15; average number of hands employed, 578, and the average number of yards per loom per day 45.90. Their production during three years was, pounds, 6,261,655; pieces, 527,114; yards, 20,364,919. The original factory property was purchased about ten years ago from the city of Augusta for $140,000, on ten years' credit. Already the entire property has been paid for.

APPENDIX C.

NATIVE PHOSPHATES OF SOUTH CAROLINA.

Dr. N. A. Pratt, the chemist and general superintendent of the Charleston, South Carolina, Mining and Manufacturing Company, has contributed an article to the Southern Cultivator upon the discovery and extent of the phosphatic deposits, and the following is abridged from his description.

The calcareous beds of South Carolina are justly considered the most remarkable perhaps in the world, and very early attracted attention; and in the time of the late venerable Edmund Ruffin, esq., were extensively explored and analyzed. Many subsequent explorers—among whom stand pre-eminent Professor M. Tuomey, State geologist of South Carolina,

and Professor F. S. Holmes, of the Charleston college—have so systematically explored and studied these beds that, previous to the year 1850, they were as well and widely known geologically and palæontologically as any other equally extensive in the world.

The calcareous marls of South Carolina have been closely studied, classified, and analyzed, and their value as marls, containing a small percentage of phosphate of lime, has been known for 20 years; but there is another bed, not of marl, but adjacent to these, equally well known and described, the composition of which has, until lately, been unknown and misunderstood.

Reference to the Geology of South Carolina, by Professor M. Tuomey, published in 1848, will show all that was known of them up to the year 1867, viz:

1st. That the calcareous beds of this section had been carefully studied, classified, and analyzed, and were known to contain from 50 to 85 per cent. of carbonate of lime, and from 2 to 9.20 per cent. of phosphate of lime.

2d. That the marlstones, nodules, or conglomerates, (constituting a bed which overlies the newer eocene marls,) bedded in the clay, were universally considered as silicified, having lost all or most of their lime, which rarely exceeded six per cent.—(Tuomey's Geology of South Carolina, p. 165.)

3d. That the fossil bones, marine and terrestrial, were also considered petrified or silicified.

See, also, the magnificent work on the "Post Pliocene Fossils of South Carolina," by Professor F. S. Holmes, (1859), Introduction, p. ii.

These are the published records; but Professor Holmes has informed Dr. Pratt that Professor Tuomey made a crude analysis of these nodules some years ago, and he thought the estimate was fifteen to sixteen per cent. of phosphate of lime, but not enough to counterbalance the carbonate of lime, iron, and sand which they also contained, and it was considered unavailable for agricultural purposes.

During the late war, while in charge of the chemical department of the C. S. Nitre and Mining Bureau, and engaged in inspecting the saltpetre beds of Charleston and Ashley river, which were constructed under the charge of Prof. F. S. Holmes, Dr. Pratt's attention was repeatedly directed by Prof. Holmes to the remarkable accumulation of fossil bones in a bed long since described and known as the "Fish Bed of the Charleston Basin," and also to the existence of from two to nine per cent. of phosphate of lime in the heavy marls below, as indicated by the analysis of Prof. C. U. Shepard, published in the Geology of South Carolina in 1848. Knowing that the marls of Georgia were comparatively poor in that ingredient, rarely exceeding three per cent., the contrast was too striking to escape notice; and the doctor took various samples to Augusta, Georgia, for examination, but more urgent matters at that time prevented the analysis, and the fact was almost forgotten.

Later, in May, 1867, Dr. Pratt was fortunate enough to discover that a bed outcropping within ten miles of Charleston contained as large a percentage of phosphate of lime as any of the phosphatic guanos imported from the tropical islands, and used in this country and abroad, for the manufacture of fertilizers.

This bed has been long known in the history of the geology of South Carolina as the "Fish Bed of the Charleston Basin," on account of the abundant remains of the marine animals found in it, Professor Holmes, of the College of Charleston, having in his cabinet not less than 60,000 specimens of sharks' teeth alone, some of them of enormous size, weighing from two to two and a half pounds each! The bed outcrops on the banks of the Ashley, Cooper, Stono, Edisto, Ashepoo, and Combahee rivers, but is developed most heavily and richly on the former, and has been found as far inland as 40 or 50 miles.

Near the Ashley river it paves the public highway for miles; it seriously impedes and obstructs the cultivation of the lands, affording scarcely soil enough to "hill-up the cotton rows," and the phosphates have been for years past thrown into piles on the lawns, or into causeways over ravines, to get them out of the reach of the ploughs; it underlies many square miles of surface continuously, at a depth ranging from six inches to twelve or more feet, and exists in such quantities that in some localities from 500 to 1,000 tons or more underlie each acre. In fact, it seems that there are no rocks in this section which are not phosphates!

Chemical analyses made by Dr. Pratt, in the laboratory of Dr. Ravenel, showed that samples from different localities contain from 34 to 55 and 67 per cent. of phosphate of lime. A company was soon after organized for thoroughly working this invaluable deposit, and South Carolina has now become the exporter rather than the importer of fertilizers.

APPENDIX D.

STATISTICAL TABLES OF COTTON PRODUCTION AND CONSUMPTION.

TABLE I.—*Statistics of British cotton trade and manufactures from* 1816 *to* 1867, *inclusive.*

NOTE.—The stock in Liverpool, April 29, 1815, consisted of 3,418 bags, from all countries, (of which only 205 bags were from the United States,) the whole, 3,418 bags, at the weight of that day, being equal to only about one-fourth of one day's consumption in Great Britain in 1867–'68.

The import of cotton from America into Liverpool was, in 1785, 5 bags; in 1786, 6 bags; in 1787, 108 bags.

	1816.	1817.	1818.	1819.	1820.	1821.
Stock in Great Britain, January 1, all kinds ....bales	....	115,800	161,300	351,800	396,800	473,100
Stock in Great Britain, January 1, all kinds ....pounds	....	29,645,000	42,906,000	93,300,000	111,800,000	127,000,000
Stock equal to supply for ....weeks	....	18	21	43	47	53
Stock in Great Britain, of American only ....bales	....	27,800	37,200	64,500	48,000	108,000
Import to Great Britain for the year, all kinds ....do	369,432	479,261	668,729	546,135	577,651	491,678
Import to Great Britain from United States ....do	166,077	199,669	207,580	205,161	302,395	300,070
Import to Great Britain from Brazil ....do	123,450	114,518	162,499	125,415	186,066	121,085
Import to Great Britain from Egypt ....do	....	....	....	....	....	....
Import to Great Britain from East Indies ....do	30,670	120,202	247,659	184,259	57,923	30,095
Import to Great Britain from West Indies, &c ....do	49,235	44,872	50,991	31,300	31,247	40,498
Weight of total import ....pounds	93,900,000	124,900,000	177,300,000	149,700,000	143,900,000	129,000,000
Weight, average, per bale ....do	256	266	263	264	249	262
Consumption in Great Britain per year, all kinds ....bales	337,400	407,000	422,700	434,300	466,900	499,100
Consumption in Great Britain per year, all kinds ....pounds	88,700,000	107,000,000	109,900,000	109,500,000	120,300,000	129,000,000
Actual average consumption per week, all kinds ....bales	6,488	7,826	8,129	8,352	8,979	9,598
Actual average consumption per week, American ....do	4,036	3,509	3,343	3,993	4,579	5,985
Average weekly consumption, bales, of 426 pounds each	5,364	6,515	6,752	6,936	7,455	7,971
Taken at Liverpool on speculation, year ....bales	28,700	33,700	24,600	46,800	36,600	32,000
Export from Great Britain, year ....do	29,300	26,700	55,500	66,800	28,400	52,600
Weight of yarn in Great Britain, January 1 ....pounds	....	....	....	16,100,000	16,700,000	23,900,000
Average price of Upland, in Liverpool, per pound ....pence	18½	20¼	20	13½	11½	9½
Average price of Surats, in Liverpool, per pound ....do	15¼	17	15⅜	9¼	8½	7⅞
Extreme prices in Liverpool, New Orleans, "fair" to "good" ....do	22 a 24	20 a 25¼	20½ a 25	15½ a 21	14 a 17	12½ a 14
Crop grown and received at ports in United States ....bales	....	....	....	....	430,000	455,000

TABLE I.—*Statistics of British cotton trade and manufactures, &c.*—Continued.

	1822.	1823.	1824.	1825.	1826.	1827.
Stock in Great Britain, January 1, all kinds .... bales...	413, 100	342, 500	415, 800	297, 400	445, 900	422, 000
Stock in Great Britain, January 1, all kinds .... pounds..	113, 900, 000	93, 700, 000	117, 300, 000	80, 300, 000	115, 500, 000	110, 900, 000
Stock equal to supply for .... weeks.	43	33	39	26	38	43
Stock in Great Britain, of American only .... bales...	123, 000	122, 000	214, 600	95, 500	150, 000	163, 100
Import to Great Britain for the year, all kinds .... do...	533, 444	668, 797	540, 092	820, 883	581, 950	894, 063
Import to Great Britain from United States .... do....	329, 906	452, 538	282, 371	423, 446	395, 852	646, 776
Import to Great Britain from Brazil .... do....	143, 505	144, 611	143, 310	193, 942	55, 590	120, 111
Import to Great Britain from Egypt .... do....	....	5, 623	38, 022	111, 023	47, 621	22, 450
Import to Great Britain from East Indies .... do....	19, 263	38, 393	50, 852	60, 484	64, 699	73, 738
Import to Great Britain from West Indies, &c .... do...	40, 770	27, 632	25, 537	31, 988	18, 168	30, 982
Weight of total import .... pounds..	142, 200, 000	188, 100, 000	143, 700, 000	222, 400, 000	171, 500, 000	271, 100, 000
Weight, average, per bale .... do ...	267	281	266	270	295	303
Consumption in Great Britain per year, all kinds .... bales...	544, 800	560, 100	604, 900	599, 600	510, 900	674, 800
Consumption in Great Britain per year, all kinds .... pounds..	145, 500, 000	154, 100, 000	165, 200, 000	166, 800, 000	150, 200, 000	197, 200, 000
Actual average consumption per week, all kinds .... bales ..	10, 477	10, 771	11, 633	11, 531	9, 825	12, 977
Actual average consumption per week, American .... do....	6, 043	6, 686	7, 264	6, 515	6, 865	8, 854
Average weekly consumption, bales, of 426 pounds .... each...	8, 703	8, 948	9, 663	9, 580	8, 162	10, 779
Taken at Liverpool on speculation, year .... bales...	23, 000	160, 000	81, 000	458, 000	71, 000	67, 000
Export from Great Britain, year .... do...	59, 300	35, 400	53, 600	72, 800	95, 000	69, 100
Weight of yarn in Great Britain, January 1 .... pounds..	23, 200, 000	28, 000, 000	27, 400, 000	33, 600, 000	32, 600, 000	42, 200, 000
Average price of Upland, in Liverpool, per pound .... pence...	8¼	8½	8¼	11½	6¾	6½
Average price of Surats, in Liverpool, per pound .... do....	6¼	6¾	6¼	8½	5½	5½
Extreme prices in Liverpool, New Orleans "fair" to "good" .... do....	10¼ a 12¼	11 a 13	11 a 13	12 a 22	8 a 11¼	8¼ a 9½
Crop grown and received at ports in United States .... bales...	495, 000	560, 000	569, 000	720, 000	957, 000	721, 000
Consumption in United States, year ending August 31 .... do....	....	....	....	....	100, 000	105, 000
Consumption on continent of Europe, year ending December 31 .... do....	....	....	....	....	....	....

TABLE I.—*Statistics of British cotton trade and manufactures, &c.*—Continued.

	1828.	1829.	1830.	1831.	1832.	1833.
Stock in Great Britain, January 1, all kinds.....bales...	572, 200	525, 900	409, 300	415, 300	386, 300	330, 200
Stock in Great Britain, January 1, all kinds.....pounds..	164, 800, 000	147, 000, 000	115, 500, 000	118, 800, 000	114, 400, 000	103, 700, 000
Stock equal to supply for.....weeks..	44	37	29	26	23	19
Stock in Great Britain, of American only.....bales...	334, 900	247, 800	182, 400	238, 800	225, 200	203, 000
Import to Great Britain for the year, all kinds.....do....	749, 532	746, 707	871, 487	903, 367	902, 322	930 216
Import to Great Britain from United States.....do....	444, 390	463, 076	618, 527	608, 887	628, 766	654, 786
Import to Great Britain from Brazil.....do....	167, 362	159, 536	191, 468	168, 288	114, 585	163, 193
Import to Great Britain from Egypt.....do....	32, 889	24, 739	14, 752	38, 124	41, 183	3, 893
Import to Great Britain from East Indies.....do....	84, 855	80, 489	35, 019	76, 764	109, 298	94, 698
Import to Great Britain from West Indies, &c.....do....	20, 056	18, 867	11, 721	11, 304	8, 490	13, 646
Weight of total import.....pounds..	219, 800, 000	221, 800, 000	261, 200, 000	280, 500, 000	287, 800, 000	304, 200, 000
Weight, average, per bale.....do....	293	297	300	310	319	327
Consumption in Great Britain per year, all kinds.....bales...	732, 200	745, 200	832, 100	857, 800	891, 300	880, 000
Consumption in Great Britain per year, all kinds.....pounds..	217, 900, 000	219, 200, 000	247, 600, 000	262, 700, 000	276, 900, 000	287, 000, 000
Actual average consumption per week, all kinds.....bales...	14, 080	14, 331	16, 002	16, 496	17, 140	16, 923
Actual average consumption per week, American.....do....	9, 835	9, 631	10, 668	11, 558	12, 059	12, 528
Average weekly consumption, bales of 426 pounds each.....	11, 696	11, 907	13, 058	14, 257	13, 708	14, 062
Taken at Liverpool on speculation, year.....bales...	96, 000	41, 500	65, 000	35, 500	90, 600	268, 000
Export from Great Britain, year.....do....	63, 700	118, 100	33, 400	74, 600	67, 100	67, 800
Weight of yarn in Great Britain, January 1.....pounds..	44, 900, 000	50, 500, 000	57, 300, 000	62, 700, 000	58, 800, 000	71, 700, 000
Average price of Upland, in Liverpool, per pound.....pence..	6⅝	5¼	6½	6	6¼	8¼
Average price of Surats, in Liverpool, per pound.....do....	4⅞	4	5	4⅛	5	6⅛
Extreme prices in Liverpool, New Orleans "fair" to "good".....do....	8 a 9	7½ a 9	8 a 9	7½ a 8	8 a 9	9 a 14
Crop grown and received at ports in United States.....bales...	870, 000	977, 000	1, 039, 000	987, 000	1, 070, 000	1, 205, 000
Consumption in United States, year ending August 31.....do....	125, 000	115, 000	140, 000	195, 000	195, 000	215, 000
Consumption on continent of Europe, year ending December 31.....do....	371, 800	473, 800	367, 900	447, 200	468, 700	470, 000

TABLE I.—*Statistics of British cotton trade and manufactures, &c.*—Continued.

	1834.	1835.	1836.	1837.	1838.	1839.
Stock in Great Britain, January 1, all kinds ....bales...	300, 100	245, 600	280, 000	364, 000	359, 300	471, 000
Stock in Great Britain, January 1, all kinds ....pounds..	94, 400, 000	82, 300, 000	89, 600, 000	116, 300, 000	115, 600, 000	160, 900, 000
Stock equal to supply for ....weeks..	18	14	15	19	18	20
Stock in Great Britain, of American only ....bales.	173, 600	159, 500	144, 300	137, 500	158, 100	316, 100
Import to Great Britain for the year, all kinds ....do....	951, 034	1, 091, 253	1, 203, 374	1, 175, 975	1, 428, 600	1, 116, 200
Import to Great Britain from United States ....do....	733, 528	763, 199	764, 707	844, 812	1, 124, 800	814, 500
Import to Great Britain from Brazil ....do....	103, 646	143, 572	148, 715	117, 005	137, 500	99, 300
Import to Great Britain from Egypt ....do....	7, 277	43, 721	34, 933	41, 193	29, 700	33, 500
Import to Great Britain from East Indies ....do....	89, 098	117, 965	219, 493	145, 174	107, 200	132, 900
Import to Great Britain from West Indies, &c ....do....	17, 485	22, 796	35, 506	27, 791	29, 400	36, 000
Weight of total import ....pounds..	330, 600, 000	361, 700, 000	410, 800, 000	408, 200, 000	501, 000, 000	388, 600, 000
Weight, average, per bale ....do....	337	331	342	347	350	348
Consumption in Great Britain per year, all kinds ....bales...	918, 700	954, 100	1, 011, 500	1, 057, 300	1, 206, 600	1, 114, 400
Consumption in Great Britain per year, all kinds ....pounds..	303, 400, 000	318, 100, 000	347, 400, 000	365, 700, 000	416, 700, 000	381, 700, 000
Actual average consumption per week, all kinds ....bales...	17, 667	18, 348	19, 452	20, 333	23, 204	21, 430
Actual average consumption per week, American ....do....	13, 592	14, 073	14, 370	14, 971	17, 564	15, 644
Average weekly consumption, bales, of 426 pounds each	15, 243	14, 679	16, 161	16, 896	18, 844	17, 055
Taken at Liverpool on speculation, year ....bales...	222, 300	145, 100	152, 500	199, 000	291, 500	263, 000
Export from Great Britain, year ....do....	86, 800	102, 800	105, 900	123, 400	103, 300	117, 300
Weight of yarn in Great Britain, January 1 ....pounds..	67, 800, 000	78, 700, 000	82, 500, 000	85, 200, 000	105, 100, 000	113, 700, 000
Average price of Upland, in Liverpool, per pound ....pence..	8⅜	10⅛	9⅜	7	7	7⅜
Average price of Surats, in Liverpool, per pound ....do....	6⅜	7⅛	6⅜	4⅝	5	5⅝
Extreme prices in Liverpool, New Orleans "fair" to "good" ....do....	10 a 12½	12 a 14½	12 a 14	9 a 13	9½ a 10	9 a 11
Crop grown and received at ports in United States ....bales..	1, 254, 000	1, 361, 000	1, 423, 000	1, 801, 000	1, 361, 000	2, 178, 000
Consumption in United States, year ending August 31 ....do...	216, 000	237, 500	257, 500	244, 000	265, 000	296, 000
Consumption on continent of Europe, year ending December 31 ....do...	491, 300	520, 900	668, 500	702, 700	793, 400	593, 600

TABLE I.—*Statistics of British cotton trade and manufactures, &c.*—Continued.

	1840.	1841.	1842.	1843.	1844.	1845.
Stock in Great Britain, January 1, all kinds ....bales..	355, 500	584, 000	619, 400	674, 400	920, 700	1, 036, 900
Stock in Great Britain, January 1, all kinds ....pounds..	125, 800, 000	207, 000, 000	216, 700, 000	242, 300, 000	342, 000 000	390, 200, 000
Stock equal to supply for ....weeks..	17	24	27	30	35	38
Stock in Great Britain, of American only ....bales..	242, 300	403, 000	344, 600	373, 400	593, 200	654, 900
Import to Great Britain for the year, all kinds ....do...	1, 599, 500	1, 344, 000	1, 392, 900	1, 744, 100	1, 681, 600	1, 855, 700
Import to Great Britain from the United States ....do...	1, 237, 500	902, 500	1, 013, 400	1, 396, 800	1, 246, 900	1, 499, 600
Import to Great Britain from Brazil ....do...	85, 300	94, 300	87, 100	98, 700	112, 900	110, 200
Import to Great Britain from Egypt ....do...	38, 000	40, 700	19, 600	48, 800	66, 700	82, 000
Import to Great Britain from East Indies ....do...	216, 400	273, 600	255, 500	182, 100	237, 600	155, 100
Import to Great Britain from West Indies, &c ....do...	22, 300	32, 900	17, 300	17, 700	17, 500	8, 800
Weight of total import ....pounds..	583, 400, 000	489, 900, 000	528, 500, 000	667, 000, 000	644, 400, 000	716, 300, 000
Weight, average, per bale ....do...	365	365	379	382	383	386
Consumption in Great Britain, per year, all kinds ....bales..	1, 251, 300	1, 192, 300	1, 160, 400	1, 367, 300	1, 428, 600	1, 574, 400
Consumption in Great Britain, per year, all kinds ....pounds..	458, 900, 000	438, 100, 000	435, 100, 000	517, 800, 000	544, 000, 000	606, 600, 000
Actual average consumption per week, all kinds ....bales..	24, 063	22, 929	22, 315	26, 294	27, 473	30, 277
Actual average consumption per week, American ....do ..	19, 592	17, 573	17, 178	21, 355	21, 654	24, 804
Average weekly consumption, bales, of 426 pounds each	20, 726	19, 749	19, 637	23, 390	24, 568	27, 363
Taken at Liverpool on speculation, year ....bales..	229, 000	195, 800	259, 200	480, 700	478, 800	564, 000
Export from Great Britain, year ....do ..	119, 700	116, 300	134, 400	120, 200	136, 800	122, 800
Weight of yarn in Great Britain, January 1 ....pounds..	99, 000, 000	107, 500, 000	115, 700, 000	136, 500, 000	49, 200, 000	130, 100, 000
Average price of Upland, in Liverpool, per pound ....pence..	6	6½	5⅞	4⅝	4⅞	4⅝
Average price of Surats, in Liverpool, per pound ....do ..	4¼	4¼	4	3⅛	3½	3
Extreme price in Liverpool, New Orleans, "fair" to "good" ....do...	8½ a 9	8½ a 8¾	8½ a 9	8 a 8½	7 a 8½	7 a 8
Crop grown and received at ports in United States ....bales..	1, 635, 000	1, 684, 000	2, 379, 000	2, 030, 000	2, 395, 000	2, 101, 000
Consumption in United States year ending August 31 ....do ..	315, 000	327, 000	295, 000	342, 500	367, 500	390, 000
Consumption on continent of Europe year ending December 31 ....do...	1, 048, 700	1, 092, 700	1, 039, 600	1, 082, 700	1, 071, 400	781, 600

TABLE I.—*Statistics of British cotton trade and manufactures, &c.*—Continued.

	1846.	1847.	1848.	1849.	1850.	1851.
Stock in Great Britain, January 1, all kinds .... bales..	1,195,400	658,800	511,900	598,600	659,400	622,400
Stock in Great Britain, January 1, all kinds .... pounds..	453,500,000	245,400,000	184,100,000	230,100,000	240,300,000	231,600,000
Stock equal to supply for .... weeks..	39	22	23	27	22	21
Stock in Great Britain, of American only .... bales..	808,100	397,800	286,200	348,300	389,900	343,900
Import to Great Britain for the year, all kinds .... do...	1,134,100	1,232,700	1,740,000	1,905,400	1,749,300	1,903,500
Import to Great Britain from United States .... do ..	932,000	874,100	1,375,400	1,477,700	1,184,200	1,393,700
Import to Great Britain from Brazil .... do...	84,000	110,200	100,200	163,800	171,800	108,700
Import to Great Britain from Egypt .... do...	59,600	20,700	29,000	72,600	79,700	67,400
Import to Great Britain from East Indies .... do...	49,500	222,800	227,500	182,200	307,900	328,800
Import to Great Britain from West Indies, &c .... do ..	9,000	4,900	7,900	9,100	5,700	4,900
Weight of total import .... pounds..	480,500,000	464,900,000	686,400,000	754,300,000	685,600,000	760,100,000
Weight, average, per bale .... do ..	386	377	395	396	392	399
Consumption in Great Britain, per year, all kinds .... bales..	1,585,900	1,157,800	1,463,600	1,590,400	1,514,500	1,663,400
Consumption in Great Britain, per year, all kinds .... pounds..	614,300,000	441,400,000	576,600,000	629,900,000	588,200,000	658,900,000
Actual average consumption per week, all kinds .... bales..	30,498	22,265	28,146	30,546	29,125	31,988
Actual average consumption per week, American .... do...	24,623	16,683	22,875	24,688	20,767	24,325
Average weekly consumption, bales, of 426 pounds each	27,703	19,910	26,764	28,392	26,525	29,733
Taken at Liverpool on speculation, year .... bales..	688,600	286,200	128,800	874,500	796,100	263,300
Export from Great Britain, year .... do...	194,200	221,800	189,600	254,200	271,800	268,500
Weight of yarn in Great Britain, January 1 .... pounds..	131,900,000	157,100,000	116,500,000	127,100,000	144,100,000	120,200,000
Average price of Upland, in Liverpool, per pound .... pence..	4⅞	6⅜	4⅛	5¼	7⅛	5⅜
Average price of Surats, in Liverpool, per pound .... do ..	3⅝	4⅛	3⅛	3⅜	5⅛	4
Extreme prices, in Liverpool, New Orleans, "fair" to "good" .... do...	7 a 10	8 a 10	6¼ a 8	6¼ a 8¼	9 a 10	7½ a 9½
Crop grown and received at ports in United States .... bales..	1,779,000	2,348,000	2,729,000	2,097,000	2,355,000	3,015,000
Consumption in United States year ending August 31 .... do...	445,000	458,000	596,000	602,000	603,000	466,000
Consumption on continent of Europe year ending December 31 .... do...	755,100	587,200	695,400	886,600	936,550	954,600

TABLE I.—*Statistics of British cotton trade and manufactures, &c.*—Continued.

	1852.	1853.	1854.	1855.	1856.	1857.
Stock in Great Britain, January 1, all kinds ....bales...	594, 000	807, 400	817, 500	706, 300	566, 500	492, 700
Stock in Great Britain, January 1, all kinds ....pounds..	225, 900, 000	300, 900, 000	306, 900, 000	271, 200, 000	208, 900, 000	196, 200, 000
Stock equal to supply for ....weeks..	19	23	22	19	14	12
Stock in Great Britain, of American only ....bales...	320, 800	474, 800	380, 900	367, 800	296, 300	298, 100
Import to Great Britain for the year, all kinds....do....	2, 357, 300	2, 264, 200	2, 172, 500	2, 278, 100	2, 468, 200	2, 418, 600
Import to Great Britain from United States ....do....	1, 789, 100	1, 532, 000	1, 665, 800	1, 623, 600	1, 758, 300	1, 482, 000
Import to Great Britain from Brazil ....do....	144, 200	132, 400	106, 900	134, 700	121, 600	168, 900
Import to Great Britain from Egypt....do....	189, 900	105, 400	81, 100	114, 800	113, 900	75, 900
Import to Great Britain from East Indies ....do....	221, 500	485, 300	308, 300	396, 100	463, 000	680, 500
Import to Great Britain from West Indies, &c ....do....	12, 600	9, 100	10, 400	8, 900	11, 400	11, 300
Weight of total import....pounds..	925, 200, 000	902, 400, 000	886, 600, 000	901, 100, 000	1, 021, 100, 000	976, 100, 000
Weight, average, per bale....do....	392	398	408	396	414	404
Consumption in Great Britain per year, all kinds ....bales...	1, 861, 100	1, 903, 900	1, 967, 100	2, 101, 000	2, 183, 300	2, 031, 400
Consumption in Great Britain per year, all kinds ....pounds..	739, 600, 000	760, 900, 000	776, 100, 000	839, 100, 000	891, 400, 000	826, 000, 000
Actual average consumption per week, all kinds ....bales ..	35, 790	36, 613	37, 829	40, 403	41, 987	39, 065
Actual average consumption per week, American.... do....	28, 196	27, 871	29, 610	30, 278	31, 291	27, 111
Average weekly consumption, bales, of 426 pounds each....	33, 351	34, 376	34, 985	37, 839	40, 212	37, 817
Taken at Liverpool on speculation, year ....bales ..	969, 670	428, 550	247, 100	782, 830	606, 360	393, 600
Export from Great Britain, year....do....	282, 800	330, 200	316, 600	316, 900	338, 700	337, 300
Weight of yarn in Great Britain, January 1 ....pounds..	127, 100, 000	124, 500, 000	129, 200, 000	124, 500, 000	165, 500, 000	181, 500, 000
Average price of Upland, in Liverpool, per pound....pence ..	5⅝	5⅞	5⅝	5⅞	6	7¾
Average price of Surats, in Liverpool, per pound ....do....	3⅝	3½	3¼	3⅝	4⅜	5⅜
Extreme prices in Liverpool, New Orleans "fair" to "good"....do....	7½ *a* 8¼	8 *a* 8½	8 *a* 8¼	8 *a* 8¾	7½ *a* 8½	8 *a* 10½
Crop grown and received at ports in United States....bales...	3, 263, 000	2, 930, 000	2, 847, 000	3, 528, 000	2, 940, 000	3, 114, 000
Consumption in United States, year ending August 31 ....do....	680, 000	764, 000	717, 000	706, 000	771, 000	820, 000
Consumption on continent of Europe, year ending December 31 ....do....	1, 200, 900	1, 169, 100	1, 148, 900	1, 215, 000	1, 489, 700	1, 037, 600

TABLE I.—*Statistics of British cotton trade and manufactures, &c.*—Continued.

	1858.	1859.	1860.	1861.	1862.	1863.
Stock in Great Britain, January 1, all kinds .... bales ...	542, 600	462, 000	559, 500	791, 400	789, 300	433, 900
Stock in Great Britain, January 1, all kinds .... pounds ..	211, 700, 000	189, 900, 000	230, 200, 000	336, 600, 000	316, 800, 000	183, 200, 000
Stock equal to supply for .... weeks ..	14	11	13	16	17	19
Stock in Great Britain, of American only .... bales ...	265, 600	335, 500	376, 200	569, 600	339, 800	70, 300
Import to Great Britain for the year, all kinds .... do	2, 442, 600	2, 830, 100	3, 366, 500	3, 035, 700	1, 445, 000	1, 932, 200
Import to Great Britain from United States .... do	1, 863, 300	2, 086, 300	2, 580, 700	1, 841, 600	71, 750	131, 900
Import to Great Britain from Brazil .... do ...	106, 200	124, 900	103, 300	100, 000	133, 800	137, 900
Import to Great Britain from Egypt .... do	105, 600	101, 400	109, 500	97, 800	131, 750	204, 300
Import to Great Britain from East Indies .... do	361, 000	510, 700	563, 200	986, 600	1, 069, 400	1, 228, 900
Import to Great Britain from West Indies, &c .... do	6, 500	6, 800	9, 800	9, 700	38, 300	229, 200
Weight of total import .... pounds ..	1, 025, 500, 000	1, 190, 900, 000	1, 435, 800, 000	1, 261, 400, 000	533, 200, 000	691, 800, 000
Weight, average, per bale .... do	420	421	424	415	369	364
Consumption in Great Britain per year, all kinds .... bales ..	2, 174, 500	2, 296, 700	2, 523, 200	2, 363, 600	1, 185, 500	1, 303, 500
Consumption in Great Britain per year, all kinds .... pounds ..	905, 600, 000	976, 600, 000	1, 083, 600, 000	1, 007, 400, 000	449, 800, 000	476, 400, 000
Actual average consumption per week, all kinds .... bales ..	41, 817	44, 167	48, 523	45, 454	22, 794	25, 067
Actual average consumption per week, American .... do	31, 452	36, 625	41, 094	34, 789	4, 816	2, 083
Average weekly consumption, bales, of 426 pounds each	40, 932	43, 959	48, 864	45, 454	20, 305	21, 526
Taken at Liverpool on speculation, year .... bales ..	307, 800	164, 000	554, 900	1, 329, 100	....	758, 700
Export from Great Britain, year .... do	348, 700	435, 900	608, 400	677, 200	564, 900	735, 100
Weight of yarn in Great Britain, January 1 .... pounds ..	176, 800, 000	200, 000, 000	192, 200, 000	197, 300, 000	293, 800, 000	152, 400, 000
Average price of Upland, in Liverpool, per pound .... pence ..	6½	6½	5½	Mid. Up., 8¼	17¾ (12 *a* 28½)	23½ (20½ *a* 29)
Average price of Surats, in Liverpool, per pound .... do	4½	4½	4½	Fair Surats, 6½	12 (8 *a* 18¼)	19½ (16 *a* 24½)
Extreme prices in Liverpool, New Orleans "fair" to "good" .... do	7½ *a* 9	8½ *a* 9	8¾ *a* 9	Mid. N.O 6½*a*12	12½ *a* 29	21 *a* 29½
Crop grown and received at ports in United States .... bales ..	3, 851, 000	4, 676, 000	3, 656, 000	*Est. 4,500.000	*Est. 1,600,000	*Est. 450, 000
Consumption in United States, year ending August 31 .... do	596, 000	928, 000	972, 000	814, 000	*Est. 370, 000	*Est. 288, 000
Consumption on continent of Europe, year ending December 31 .... do	1, 340, 500	1, 524, 300	1, 591, 000	1, 522, 000	816, 000	893, 000

**Growth.*—No account preserved of "receipts at ports" for the years 1861–'62 to 1864–'65, inclusive.

TABLE I.—*Statistics of British cotton trade and manufactures, &c.*—Continued.

	1864.	1865.	1866.	1867.	1868.
Stock in Great Britain, January 1, all kinds .... bales...	327,500	575,700	405,500	581,600	554,800
Stock in Great Britain, January 1, all kinds .... pounds..	137,700,000	226,000,000	182,600,000	255,100,000	221,700,000
Stock equal to supply for .... weeks..	13	18	10	13	12
Stock in Great Britain, of American only .... bales...	38,200	23,400	144,100	167,390	103,700
Import to Great Britain for the year, all kinds .... do....	2,587,100	2,755,300	3,749,000	3,501,000	3,660,000
Import to Great Britain from United States .... do....	197,800	461,900	1,162,700	1,225,700	1,269,000
Import to Great Britain from Brazil .... do....	212,200	340,300	407,600	437,200	636,900
Import to Great Britain from Egypt .... do....	257,100	333,600	167,500	181,200	188,700
Import to Great Britain from East Indies .... do....	1,399,500	1,266,500	1,847,800	1,508,800	1,452,000
Import to Great Britain from West Indies, &c .... do....	520,500	353,000	163,400	148,100	113,400
Weight of total import .... pounds..	896,800,000	965,700,000	1,357,000,000	1,275,200,000	1,296,958,000
Weight, average, per bale .... do....	347	355	362	364	354
Consumption in Great Britain per year, all kinds .... bales...	1,606,400	2,034,700	2,436,400	2,512,500	2,601,940
Consumption in Great Britain per year, all kinds .... pounds..	561,200,000	718,700,000	890,700,000	954,500,000	985,475,700
Actual average consumption per week, all kinds .... bales...	30,892	39,129	46,853	48,317	53,880
Actual average consumption per week, American .... do....	3,052	5,405	17,912	20,413	21,390
Average weekly consumption, bales, of 426 pounds each	25,357	32,473	40,245	43,128	44,471
Taken at Liverpool on speculation, year .... bales...	584,800	879,600	439,000	201,750	628,000
Export from Great Britain, year .... do....	732,480	890,830	1,136,560	1,015,040	915,120
Weight of yarn in Great Britain, January 1 .... pounds..	72,200,000	40,800,000	32,900,000	37,400,000	38,700,000
Average price of middling Upland, in Liverpool, per pound .... pence...	27½ (21½ a 30¾)	19 (13¾ a 26½)	15¼ (12¼ a 20¼)	11 (7 a 15½)	10½ (7½ a 12¾)
Average price of fair Surats, in Liverpool, per pound .... do....	21 (14 a 24)	14¾ (10 a 19½)	12 (8¼ a 17¾)	8¾ (4¼ a 9)	8¾ (5¾ a 10¾)
Extreme prices in Liverpool, middling New Orleans .... do....	22 a 31½	13¼ a 26¼	12¼ a 21	7¾ a 15¼	7½ a 12¾
Crop grown and received at ports in United States .... bales...	Est. *300,000	†2,154,000	‡2,130,000	2,431,000	....
Consumption in United States, year ending August 31 .... do....	Est. 220,000	Est. 345,000	735,000	850,000	968,163
Consumption on continent of Europe, year ending December 31 .... do....	954,000	1,265,000	1,799,800	1,758,000	2,000,000

* *Growth*.—No account preserved of "receipts at ports" for the years 1861–'62 to 1864–'65, inclusive.

† Estimated *growth* of 1865 only 550,000 bales; the other receipts being of growth of previous years, and termed "*old cotton*."

‡ The receipts at ports, 1866–'67, included, probably, 400,000 to 500,000 bales of "*old cotton*."

This table of the statistics of British cotton trade and manufacture, and two others of the more extensive and valuable tables published herewith, are taken from the publications of the "National Association of Cotton Manufacturers and Planters." They had been compiled by the writer of this report, for the use of that association, from the best authorities, chiefly from the statistics of the cotton trade published by Messrs. George Holt & Co., of Liverpool.

IMPORTATION OF COTTON WOOL.

TABLE II.—*Estimated yearly average importation of cotton wool into Great Britain at various periods prior to 1816, (in pounds.)*

1701 *a* 1705	1, 200, 000	1801	56, 000, 000	1809	92, 800, 000
1716 *a* 1720	2, 200, 000	1802	60, 300, 000	1810	136, 500, 000
1771 *a* 1775	4, 800, 000	1803	53, 800, 000	1811	91, 600, 000
1776 *a* 1780	6, 700, 000	1804	61, 900, 000	1812	63, 000, 000
1781 *a* 1785	10, 900, 000	1805	59, 700, 000	1813	51, 000, 000
1786 *a* 1790	25, 400, 000	1806	58, 200, 000	1814	60, 100, 000
1791 *a* 1795	26, 700, 000	1807	74, 900, 000	1815	99, 300, 000
1796 *a* 1800	37, 300, 000	1808	43, 600, 000		

SOURCES OF SUPPLY OF COTTON.

TABLE III.—*Sources of the cotton supply of Great Britain for ten years, 1806 to 1815, inclusive, (packages.)*

	United States.	Brazil.	East Indies.	W. Indies, &c.	Total.
1806	124, 939	51, 034	7, 787	77, 978	261, 738
1807	171, 267	18, 981	11, 409	81, 010	282, 667
1808	37, 672	50, 442	12, 512	67, 512	168, 138
1809	160, 180	140, 927	35, 764	103, 511	440, 382
1810	246, 759	142, 286	79, 382	92, 186	560, 613
1811	128, 192	118, 514	14, 646	64, 879	326, 231
1812	95, 331	98, 704	2, 607	64, 563	261, 205
1813	37, 720	137, 168	1, 429	73, 219	249, 536
1814	48, 853	150, 930	13, 048	74, 800	287, 631
1815	203, 051	91, 055	22, 357	52, 840	369, 303
Total	1, 253, 964	1, 000, 041	200, 941	752, 498	3, 207, 444

COTTON MANUFACTURE AND TRADE OF GREAT BRITAIN.

TABLE IV.—*A condensed exhibit of the cotton manufacture and trade of Great Britain, 33 years.*

	Average per year.				1855.	1856.
	5 years, 1835–'39.	5 years, 1840–'44.	5 years, 1845–'49.	5 years, 1850–'54.		
Raw cotton actually consumed ....pounds..	371, 475, 000	509, 902, 000	576, 780, 000	765, 900, 000	839, 200, 000	856, 700, 000
Cost of same in dollars, $4 80 per £ sterling....	63, 552, 672	56, 641, 920	59, 101, 920	83, 981, 280	94, 175, 462	106, 220, 075
Exported goods and yarns....pounds..	212, 176, 715	284, 636, 665	337, 065, 453	413, 933, 262	528, 029, 766	562, 982, 000
Home consumption, goods and yarns....pounds..	116, 047, 465	166, 627, 039	174, 384, 848	210, 788, 222	227, 250, 234	208, 078, 200
Value of goods and yarns produced....dollars..	193, 604, 015	204, 208, 892	202, 132, 666	245, 804, 910	262, 735, 295	273, 959, 290
Proportion of value of raw cotton used to the value of goods and yarns made from it	100 a 305	100 a 362*	100 a 342	100 a 293	100 a 279	100 a 258
Amount of difference or value added by manufacturing....dollars..	130, 051, 343	147, 566, 972	143, 030, 746	161, 823, 630	168, 559, 833	167, 739, 215
	1857.	1858	1859.	1860.	1861.	*1862.
Raw cotton actually consumed ....pounds..	825, 027, 000	907, 836, 000	977, 633, 000	1, 079, 321, 000	1, 005, 477, 000	449, 821, 000
Cost of same in dollars, $4 80 per £ sterling....	119, 040, 000	119, 092, 800	132, 369, 600	138, 768, 000	154, 484, 000	128, 323, 200
Exported goods and yarns....pounds..	583, 110, 000	652, 663, 000	693, 072, 000	740, 113, 000	674, 132, 000	412, 684, 000
Home consumption, goods and yarns ....pounds..	156, 000, 000	158, 000, 000	172, 000, 000	173, 000, 000	174, 000, 000	102, 000, 000
Value of goods and yarns produced....dollars..	287, 222, 400	312, 803, 200	346, 670, 400	386, 822, 400	356, 788, 800	205, 084, 800
Proportion of value of raw cotton used to the value of goods and yarns made from it	100 a 241	100 a 254	100 a 262	100 a 279	100 a 231	100 a 160
Amount of difference or value added by manufacturing ....dollars..	168, 182, 450	183, 710, 400	214, 300, 300	248, 054, 400	202, 204, 800	76, 761, 600

* In 1862, raw cotton consumed, only .... 449, 821, 000 pounds.
Deduct the *waste* in use (larger than usual, because of low quality of cotton supplied) .... 76, 469, 000 pounds.

Which would leave in goods and yarns only .... 373, 352, 000 pounds.

Yet the export of goods and yarns was .... 412, 684, 000 pounds.
And home consumption of goods and yarns was .... 102, 000, 000 pounds.

Total .... 514, 684, 000 pounds.

Being an excess over the total production of that year of 141,332,000 pounds which was supplied from the surplus production of previous years held over.

TABLE IV.—*A condensed exhibit of the cotton manufacture and trade of Great Britain*—Continued.

	1863.	1864.	1865.	1866.	1867.
Raw cotton actually consumed .... pounds..	476, 445, 000	561, 196, 000	718, 651, 000	890, 721, 000	954, 517, 000
Cost of same in dollars, $4 80 per £ sterling	195, 307, 200	251, 817, 600	226, 833, 601	249, 398, 400	198, 057, 600
Exported goods and yarns .... pounds..	392, 239, 000	403, 999, 000	475, 920, 000	625, 602, 000	693, 700, 000
Home consumption, goods and yarns .... pounds..	93, 000, 000	110, 000, 000	150, 000, 000	145, 000, 000	145, 000, 000
Value of goods and yarns produced .... dollars..	287, 016, 000	366, 273, 600	399, 676, 800	493, 262, 400	418, 516, 800
Proportion of value of raw cotton used to the value of goods and yarns made from it	100 a 147	100 a 146	100 a 176	100 a 198	100 a 212
Amount of difference or value added by manufacturing .... dollars..	91, 708, 800	114, 456, 000	172, 843, 199	243, 864, 000	220, 459, 200

NOTE.—The item "value added by manufacturing" represents the value of this branch of British industry. It includes wages and all other expenses incurred, as well as the profits and interest upon capital employed by manufacturers. From the British tables (Ellison & Haywood's, in this case) we find the following results for the ten years 1858 to 1867, inclusive, which period includes the years of the secession war, so marked by great fluctuations. We reckon the £ sterling at $4 80 in all our tables.

	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.
Value of goods produced	£63, 084, 000	£72, 223, 000	£80, 598, 000	£74, 331, 000	£42, 726, 000	£59, 795, 000	£76, 307, 000	£83, 266, 000	£103, 121, 000	£67, 191, 000
Value of cotton used	£24, 811, 000	£27, 577, 000	£28, 910, 000	£32, 205, 000	£26, 734, 000	£40, 689, 000	£52, 462, 000	£47, 257, 000	£51, 958, 000	£41, 262, 000
Wages and other expenses paid	27, 910, 000	30, 330, 000	33, 600, 000	31, 360, 000	14, 520, 000	15, 690, 000	18, 680, 000	23, 850, 000	31, 288, 000	33, 338, 000
Total cost	52, 721, 000	57, 907, 000	62, 510, 000	63, 565, 000	41, 254, 000	56, 379, 000	71, 142, 000	71, 107, 000	83, 246, 000	74, 600, 000
Leaving for interest of capital and profits	£10, 363, 000	£14, 316, 000	£18, 088, 000	£10, 766, 000	£1, 472, 000	£3, 416, 000	£5, 165, 000	£12, 159, 000	£19, 875, 000	£12, 591, 000
Same in dollars	49, 742, 400	68, 716, 800	86, 822, 400	51, 676, 800	7, 065, 600	16, 396, 800	24, 792, 000	57, 363, 200	95, 400, 000	60, 436, 800
Proportion of cost of cotton used to amount for wages and other expenses, cost of cotton 100	100 a 112	100 a 110	100 a 116	100 a 97	100 a 54	100 a 39	100 a 36	100 a 50	100 a 60	100 a 81

APPENDIX E.

EXPORTS OF COTTON GOODS FROM NEW YORK.

Table of exports of domestic (plain) cotton goods from New York.

NOTE.—This table was prepared for this report by the Statistician of the New York Journal of Commerce. It exhibits in detail only the exports from the port of New York and the aggregate each year of the exports from Boston. These together comprise nearly the whole export of these goods from the United States. It will be observed that only plain goods, such as drills, sheetings, &c., are included in the table, excluding all colored, printed, figured, or striped goods.

Destination.	1849.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.
	Packages.	*Packages.*	*Packages.*	*Packages.*	*Packages.*	*Packages.*	*Packages.*	*Packages.*	*Packages.*	*Packages.*	*Packages.*
Mexico	1,920	2,463	820	1,479	8,765	1,713	2,972	4,897	2,084	2,446	2,475
Dutch West Indies	359	289	352	321	292	306	337	151	581	317	531
Swedish West Indies	51	16	24	21	3	3	6	10	....	4	....
Danish West Indies	116	56	261	70	82	147	284	427	564	691	696
British West Indies	19	131	131	131	89	903	499	880	207	219	227
Spanish West Indies	97	129	132	77	13	69	1,143	151	223	358	366
St. Domingo	324	1,208	1,895	736	202	208	411	228	591	262	977
British North America	4	47	195	108	56	54	16	25	42	14	18
New Grenada	163	206	153	643	396	112	131	949	560	627	967
Brazil	1,783	1,478	3,178	3,281	1,194	2,682	2,764	3,756	2,751	4,466	3,637
Venezuela	548	990	865	865	462	988	1,094	335	268	523	919
Argentine Republic	957	249	86	1,475	250	1,445	468	590	90	328	903
Cisplatine Republic	....	....	....	....	....	....	....	....	....	....	....
Central America	354	607	1,218	653	713	43	495	190	101	200	55
West coast South America	2,603	3,426	1,395	2,743	1,642	809	1,152	158	3,710	4,195	6,606
Honduras	859	101	150	246	179	276	401	160	170	436	239
Africa	475	538	1,772	3,405	1,239	1,007	1,324	1,874	1,414	1,200	323
Australia	....	....	....	....	200	529	1,908	2,060	418	109	135
East Indies and China	13,143	20,091	27,902	38,413	18,869	12,436	11,929	17,674	12,676	43,419	53,662
All others	231	130	31	25	82	550	251	267	203	180	1,793
Total packages shipped from New York	24,006	32,155	40,560	54,692	34,828	24,280	27,585	34,782	26,653	59,994	74,549
Add packages shipped from Boston to all ports	41,344	34,307	46,589	59,395	54,729	35,428	34,093	37,880	26,000	29,875	31,661
Total packages from both ports	65,350	66,462	87,149	113,987	89,557	59,708	61,678	72,662	52,653	89,869	106,210

Export of domestic (plain) cotton goods from New York—Continued.

Destination.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.
	Packages.	*Packages.*	*Packages.*	*Packages.*	*Packages.*	*Packages.*	*Packages.*	*Packages.*	*Packages.*
Mexico	4,873	2,766	2,427	1,886	849	112	282	1,090	1,837
Dutch West Indies	664	569	84	9	3	....	43	133	157
Swedish West Indies	47	38	....	....	....	....	....	....	....
Danish West Indies	952	522	316	29	1	8	16	33	87
British West Indies	497	537	165	149	24	9	58	254	399
Spanish West Indies	193	374	140	66	86	30	22	292	140
St. Domingo	2,169	1,257	484	63	12	....	9	244	69
British North America	10	60	23	16	....	....	3	....	14
New Grenada	1,381	2,005	609	356	83	11	423	575	253
Brazil	8,103	5,400	953	86	4	....	261	2,343	1,716
Venezuela	1,328	1,421	141	32	9	4	35	116	303
Argentine Republic	1,111	430	145	13	2	17	77	551	529
Cisplatine Republic	....	....	....	19	8	3	59	399	121
Central America	53	23	1	1	6	....	....	3	3
West coast of South America	13,291	5,299	1	....	2	....	293	1,024	207
Honduras	389	245	12	5	4	....	5	47	121
Africa	1,406	876	49	11	24	....	807	2,016	2,700
Australia	323	180	3	....	....	....	....	....	....
East Indies and China	47,735	31,911	187	5	7	....	6,972	4,558	15,677
All others	1,793	1,823	47	20	8	....	52	197	1,715
Total packages shipped from New York	86,318	55,736	5,787	2,776	1,132	194	9,416	13,875	26,048
Add packages shipped from Boston	33,588	18,146	4,238	421	264	308	6,802	9,031	11,422
Total packages from both ports	119,906	73,882	10,025	3,197	1,396	502	16,218	22,906	37,470

APPENDIX F.

COTTON SPINNING IN THE UNITED STATES.

[La filature du coton des Etats Unis.]

"Après l'Angleterre viennent, comme importance dans l'industrie du coton, les Etats Unis, qui comptent aujourd'hui près de 8,000,000 de broches.

Les renseignements statistiques que nous avons pu nous procurer et tirer des publications du Congrès sont moins précis que ceux que nous possédons sur les autres pays.

La filature du coton date, en Amérique, de 1824 seulement; Lowell, le Manchester Américain, possède des établissements très-importants qui, il y a quinze ans, ne comptaient encore que 5,500,000 broches; mais, depuis la reconstitution de l'Union et l'élévation des tarifs protecteurs, le nombre des filatures tend à s'accroître rapidement, et avant peu les Etats Unis auront plus de 8,000,000 de broches.

D'après des chiffres officiels, 100,000,000 de kilogrammes de coton étaient, sur la récolte, conservés chaque année en Amérique, alors qu'il n'y avait à alimenter que 5,500,000 broches; aujourd'hui les Américains doivent donc en conserver 145,000,000, qui, convertis en fils de numéros généralement assez gros, suffisent à leur consommation et leur permettent même une exportation considérable dans l'Amérique du Sud; ils n'ont donc à tirer de l'Angleterre que les numéros plus fins." (*From the Rapports du Jury International, Exposition Universelle, de* 1867.)

APPENDIX G.

EXPORTS OF COTTON FROM THE UNITED STATES.

Table of exports of American cotton from the ports of the United States to Sweden and Norway, Russia and Spain, for the years ending 30th of June, from 1849 to 1867, inclusive, giving pounds and value. (Compiled from official records for Mr. Nourse.)

Years.	Sweden and Norway.		Russia.		Spain.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1849	7,030,305	$482,474	10,650,631	$852,198	23,285,804	$1,527,720
1850	3,624,123	412,132	4,338,705	540,422	27,676,266	3,170,086
1851	5,160,974	571,616	10,098,448	1,297,164	34,272,625	4,387,262
1852	5,939,025	510,103	10,475,168	962,346	29,301,928	2,262,195
1853	6,099,517	613,857	21,286,563	2,254,345	36,851,042	3,932,095
1854	9,212,710	898,926	2,914,954	301,293	25,024,074	3,683,045
1855	8,428,437	741,278	448,897	48,647	33,071,795	3,320,134
1856	17,289,637	1,652,049	4,643,384	514,161	58,479,179	5,841,517
1857	10,038,095	1,249,042	31,933,534	4,267,234	45,557,067	6,165,751
1858	4,057,593	458,776	32,110,204	4,122,996	39,630,463	4,862,777
1859	11,032,609	1,268,302	43,619,863	5,432,422	60,522,742	7,222,908
1860	11,662,859	1,306,071	21,698,054	2,644,514	44,021,833	5,268,397
1861	582,831	73,822	4,251,273	543,432	11,155,049	1,262,136
1862	....	....	....	....	582,747	98,411
1863–'65	....	....	....	....	....	....
1866	323,380	125,845	2,685,884	1,065,803	8,815,730	3,802,040
1867	....	....	5,089,784	1,553,995	11,034,094	3,110,838

The above table was compiled for this work by the carcful and accurate statistician of the New York Journal of Commerce.

APPENDIX H.

COTTON-GROWING IN INDIA AND OTHER COUNTRIES—REPORT OF THE PROCEEDINGS OF THE MANCHESTER COTTON SUPPLY ASSOCIATION.

[From the London Times of December 26, 1868.]

At the usual meeting of the executive committee, held Tuesday, December 22, a letter was read from Dargeeling, Bengal Presidency, stating that the views which the writer expressed when in England six years ago, and which were founded upon personal experience during 12 years' residence in various parts of India, have since been fully confirmed, and that he is more than ever convinced of the possibility of securing a successful cotton field in India. New Orleans and Egyptian seed can be advantageously cultivated in that portion of the Bengal Presidency with which he is connected, as he has satisfactorily proved; and, he has no doubt, also in the neighboring districts of Doar Teraies, which contains hundreds of thousands of rich, unreclaimed acres, similar in soil and subsoil, as shown by chemical analysis, to the cotton soils of Georgia and Alabama, and capable of yielding large future supplies of fine cotton. The natives, however, are so averse to change their rude agricultural system, and are so firmly attached to their patriarchal method of husbandry, that it is extremely difficult to persuade them to enhance the value of their crops by means of superior seed and a better mode of cultivation. Moreover, the common country churka is not well adapted for cleaning New Orleans and Egyptian cotton, and they are therefore naturally disinclined to cultivate crops from foreign seeds, the produce of which, unginned, is actually of less local value than the crops from inferior indigenous seed. It was therefore resolved to send out, at the expense of the association, some gins to meet the exigency, as well as a fresh supply of New Orleans and Egyptian seed. A letter was received from Broach, stating that a prize list of the Broach exhibition, which was to open on the 22d of December, has been forwarded, and, consequently, that the medals and money offered by the association will be immediately awarded. A letter was read from the Cape of Good Hope, acknowledging a grant made by the association of seed, which has been publicly offered for distribution to all persons willing to give cotton cultivation a fair trial in the colony. The only article of export (wool) being very low in price in the home market, it has become necessary to try some other industry, and it is expected that self-interest will induce many to grow cotton largely, though the people are somewhat apathetic. His excellency the governor has taken an interest in the subject, and it is hoped that government influence will have a beneficial effect upon the natives. All that is wanted to make the colony a valuable cotton-producing country is a little enterprise, and some capital judiciously expended. A report, forwarded by the foreign office, upon the cultivation of cotton at Guayana was received from Her Majesty's chargé d'affaires

at Caracas, and a consular return from Rio Grande do Sul. In Venezuelan Guayana, want of agricultural laborers, owing to a scanty population and the discovery of rich gold fields, are, and will continue to be, the only hindrances to the extensive cultivation of cotton in this state. Venezuelan Guayana offers to the cotton planter all the advantages that could be desired—an immense territory traversed by navigable rivers and streams, which facilitate the means of transport, abundance of excellent pasturage and agricultural lands, and well-distributed seasons for sowing and picking. Cuidad Bolivar, the capital of the state, is the only port on the Orinoco for embarcation, and every facility exists for storing and shipping produce. The local tax on cotton amounts to 100 cents, and the export duty to 80 cents per 100 pounds. The cotton shipped from this port to Liverpool, New York, Hamburg, and Bremen, is brought from the adjacent states, but principally from the state of Zamoza, (Varinas.) The cotton exported during the year to the above-mentioned ports amounts to 225,400 pounds, and the stock on hand to 1,024 bales of 100 pounds. In the province of Rio Grand do Sul cotton cultivation has proved unsuccessful. Though the plant was not uncommon in many gardens and fields, where it grew spontaneously, no cotton previous to the American war was raised for export. In the year 1864, its cultivation on an extended scale was commenced by Mr. John Proudfoot; he sent to Scotland for laborers, and introduced the most modern and approved agricultural implements, as well as quantities of foreign or exotic seeds. This seed he distributed gratuitously to every person who would accept it, and he agreed to purchase, at remunerative rates, all the cotton they could raise. His exertions and outlay were not, however, successful; the laborers he brought out were novices in the science of cotton cultivation, equally with the natives of the country. It was an experiment begun by people having no practical experience; various mistakes were made in consequence, and to this may be attributed, in a great measure, the failure of cotton cultivation in this province. In the German colonies very little cotton is now planted; as long as other agricultural produce obtains such high prices as hitherto, cotton will be neglected as an article of export. In these colonies a good deal of flax is produced and spun. Many of the colonists wear home-made clothing. The climate is considered better adapted for flax than for cotton.

APPENDIX I.

NOTICE OF ERRONEOUS COTTON STATISTICS.

The following extract is from DeBow's "Industrial Resources of the Southern and Western States, vol. 1, p. 216:

"It has already been stated in a former part of this work that Massachusetts is the principal manufacturing State in this country. An act

was passed by the senate and house of representatives of that State, in 1837, for the purpose of obtaining 'statistical information in relation to certain branches of industry within the commonwealth.' The following table is copied from the report of the secretary of the commonwealth, which he prepared from the returns of the assessors in the various towns and cities in the State:

Statement of the cotton manufactures in twelve of the States in 1831.

States.	Capital.	Number of spindles.	Yards of cloth produced y'rly	Pounds cloth produced y'rly	Pounds cotton consumed y'rly
Maine	$765,000	6,500	1,750,000	525,000	588,500
New Hampshire	5,300,000	113,776	29,060,500	7,255,060	7,845,000
Vermont	295,500	12,392	2,238,400	574,500	760,000
Massachusetts	12,891,000	339,777	79,231,000	21,301,062	24,871,981
Rhode Island	6,262,340	235,753	31,121,681	9,271,481	10,414,578
Connecticut	2,825,000	115,528	20,055,500	5,612,000	6,777,209
New York	3,669,500	157,316	21,010,910	5,297,713	7,661,670
New Jersey	2,027,644	62,979	5,133,776	1,877,418	5,832,204
Pennsylvania	3,758,500	120,810	21,332,467	4,207,192	7,111,174
Delaware	384,000	24,806	5,203,746	1,201,500	1,435,000
Maryland	2,144,000	47,222	7,649,000	2,224,000	3,008,000
Virginia	290,000	9,844	675,000	168,000	1,152,000
Total	40,612,984	1,246,703	230,461,990	59,514,926	77,457,316

"The preceding table shows the extent of the cotton manufacture in the United States in 1831; since that time there has been a considerable increase."

It will be observed that the foregoing extract from DeBow purports to give the statistics of the cotton manufactures in 12 States in 1831, from the returns made by the assessors in the various towns and cities in the State of Massachusetts in obedience to a law passed in 1837.

The apparent incongruity may have occurred by a mistake in arrangement. But there are errors in the table which cannot be excused, and indicate that it was made up from random estimates without proper data.

The present average number of yarn is 27½; in 1831 it was not probably finer than No. 18. The present average consumption of cotton per spindle is 65 pounds; and in the southern States, on an average of about No. 13 yarn, it is 138 pounds per spindle each year; the number of spindles employed and pounds of cotton consumed in 1831, according to the table, allow only 62½ pounds per spindle, or less than the present rate; spinning, 50 per cent. finer.

The difference between the pounds of cotton consumed and the pounds of cloth and yarn produced should be the "waste" in working. With medium grades of cotton, producing medium goods, the waste now would be about 16 per cent. In 1831 it was probably 20 per cent. In Mr. De Bow's table the waste in 1831 was shown to be, in New Hampshire, 7½ per cent.; in Maine, 10 per cent.; in New York, 30 per cent.; in Pennsyl-

vania, 40 per cent.; in New Jersey, 67 per cent.; in Virginia, 85 per cent. As only pounds of cloth are stated in the table for production, some allowances should be made for yarn produced and sold unwoven; but this would furnish a correction only in the cases of excessive waste, for it would aggravate the error when the waste is too small already; and then Mr. De Bow appends, below the table quoted, another one, in which he gives the number of looms employed in 1831 as 33,433, equal to one for each 37 spindles, quite enough to weave all the yarn produced, even if the waste was less.

APPENDIX K.

LIST OF PRINCIPAL EXHIBITORS OF COTTON AND OF THE AWARDS.

ENGLAND—MANCHESTER COTTON SUPPLY ASSOCIATION.

The collection of samples of cotton from the localities mentioned in the list given on page 9, was made and exhibited by the Manchester Cotton Supply Association. It comprised samples from most of the cotton-producing countries, and from nearly all of the sources mentioned in the catalogue appended to the report of the International Jury.—(See Appendix L.)

EXHIBITORS FROM THE UNITED STATES.

ALABAMA, STATE OF.—Samples of cotton. Silver medal and honorable mention.

HODGSON, J., Alabama.

HUMPHRIES, JOHN C., parish of Rapides, Louisiana.—Samples of cotton. Bronze medal.

ILLINOIS CENTRAL RAILROAD COMPANY.—Hemp, flax, cotton, and tobacco. Silver medal.

JOHNSON, C. G., New Orleans, Louisiana.—Specimen of cotton; in the Louisiana cottage.

MAGINNIS, A. A., New Orleans, Louisiana.—Cotton seeds.

MEYER, VICTOR, parish of Concordia, Louisiana.—Sample of cotton. Gold medal.

MISSOURI, STATE OF.—Cotton, hemp, cashmere wool.

OGLESBY, J. H., New Orleans, Louisiana.

TOWNSEND, J., Edisto Island, South Carolina.—Specimen of fine sea island cotton.

TRAGER, LOUIS, Black Hawk Point, Louisiana.—Samples of cotton. Gold medal.

WELLS, J. M., parish of Rapides, Louisiana.

EXHIBITORS FROM OTHER COUNTRIES.

We have not space to name in detail the exhibitors from other countries, who were very numerous. There were 20 from Greece; 35 from Italy; 50 from Turkey and other parts of the Ottoman Empire; 60 from Algeria, (in which Kabyle and Arab names mingle with French names;) and goodly numbers from Egypt, Brazil, British India, China, Hawaii, the South American Republics, the colonies of Spain, Portugal, England, France, and other countries in Europe; from nearly all the South Sea islands, Polynesia, the islands of the Indian ocean, and all the coasts of Africa, Asia, &c.

Contrasted with all these, the samples from the United States were insignificant in number and quality, as they were unworthy to represent the principal source of the commercial cotton supply of the world. It must, therefore, have been rather of courtesy than of right, rather of prior knowledge of the true position of our country in the production of cotton, than of evidences presented at the Exposition, that such liberal recognition of exhibitors from the United States was made in the distribution of *récompenses.*

LIST OF AWARDS.

[Exhibitors of long staple cotton marked.*]

GRAND PRIZE.—To Algeria, Brazil, Egypt, Ottoman Empire, British India, Italy.

GOLD MEDALS.—To L. Trager, Black Hawk Point, Louisiana, United States; Victor Meyer, Concordia, Louisiana, United States; Masquelia fils et Cie., *Saint Denis du Sig., Algeria; Towns, *Brisbane, Queensland, Australia.

SILVER MEDALS.—To Herzog, *Oran, (province of) Algeria; L. Dacosta,* Rio Grande du Sud., Brazil; The State of Alabama, United States; Sideri, Naples, Italy.

BRONZE MEDALS.—To *Davis, Queensland, Australia; to *Dufourg, Biskra, Algeria; to *Fleury, Hennaya, Algeria; to *Ferré, Oran, Algeria; to *Soarez & Cie, Tahiti, French colonies; to *Winter, Guiana, English colonies; to Davies, Cumana, Venezuela; to J. C. Humphries, Louisiana, United States; to Dodero, Barcelona, Spain; to The Baroness Camorata, Scorazzo, Italy; to Basetto Fisola, Venice, Italy; to Senoval, Porto Rico, Spanish Antilles; to Cabrera, Porto Rico, Spanish Antilles; to Ali Pacha, ——, Egypt; to Pic ainé, Guadaloupe, French colonies; to John Proudfoot, Rio Grande, Brazil.

HONORABLE MENTION.—To *Winter, Guiana, English colonies; to *Bellecôte, Bone, Algeria; to *Danté, Oran, Algeria; to *Goulard, Constantine, Algeria; to *Guieysse, Algiers, Algeria; to *Jacques, Elezane, Algeria; to *Laquiere, Bone, Algeria; to *Leseure, Oran, Algeria; to *Vallier, Lac Halloula, Algeria; to *Viret, Dellys, Algeria; to *Cordier, La Rassauta, Algeria; to *Chuffart, Oued-el Halengh, Algeria; to *Goussons, Oued-

el-Haleugh, Algeria; to *Sebourt, Saint-Denis-du-Sig., Algeria; to *Sœurs Saint Bernard, Saint-Denis-du-Sig, Algeria; to *Hallaire, Italy; to *Barbolace, Calabria; to *F. L. Davis, Venezuela; to *Panton, Queensland, English colonies; to *Orr, Queensland, English colonies; to *P. F. Fairburn, British Guiana, English colonies; to *Leroux, Préville, Martinique, French colonies; to *Albert, Préville, Martinique, French colonies; to *Bonneville, Guadaloupe, French colonies; to *Bonnet, Guadaloupe, French colonies; to *Monègre, Guadaloupe, French colonies; to *Heilmann, Senegal, French colonies; to *N'Gour Coumba N'Dar, Senegal, French colonies; to *John Gregor, New South Wales, English colonies; to J. L. Michael, New South Wales, English colonies; to Ensworth, New South Wales, English colonies; to O. B. Zanellia, New South Wales, English colonies; to Sub-Commission of Lecco, Italy; to Jourdon, Naples, Italy; to Société Cipontine, (Bro's Menzini,) Italy; to Don Emmanuel Lisi, Italy; to Grossi, Italy; to Gallozzi Frères, Naples, Italy; to Garnier, Duvivier, Algeria; to State of Alabama, United States; to Achmet Bey, Salonica, Turkey; to Adolphe Runge, Porto Rico, Brazil; to Almeida, Mossamedes, Portuguese colonies; to Botelho, Novo Rotundo, Portuguese colonies; to Alvez, Mozambique, Portuguese colonies; to Xavier, Pangein, Portuguese colonies; to Count d'Audlau, Martinique, French colonies; to Abbé Granger, Guadaloupe, French colonies; to Beauperthuy, Guadaloupe, French colonies; to Goyrieua, French Guiana, French colonies; to Arda d'Elteil, Senegal, French colonies; to Fritz Koechlin, Senegal, French colonies; to Touaris Frères, Réunion, French colonies; to Lopez de Oliveira, Saint Paul, Brazil; to Mavanhas, Brazil; to José Barboza, Brazil; to Le Maréchal del Duero, Spain; to the Viceroy, Egypt; to François, Tournabene, Catania, Italy; to Jardin Botanique de Naples, Italy; to Hortolès fils, Montpellier, France; to Lacau, Calvi, France.

APPENDIX L.

REPORT UPON THE PRODUCTION OF COTTON.

BY M. ENGEL DOLLFUS, MEMBER OF THE INTERNATIONAL JURY.

[Translated from Volume VI of the "Rapports du Jury International." [1]]

I. PRODUCTION AND CONSUMPTION OF COTTON BEFORE AND AFTER THE WAR OF THE UNITED STATES.

It would be difficult to find in the annals of industry a situation so threatening and perilous as that which the prospect of a prolonged war in the United States offered to industrial Europe in the year 1860.

The fate of the most important of our industries was regarded with increasing anxiety at the thought of seeing the almost exclusive sources of cotton supply exhausted; especially in England, where the manufacture of cotton employs directly 400,000 to 500,000 persons in 2,715 establishments, containing 28,000,000 spindles and 368,000 looms, the danger causing preoccupations of the gravest nature to agitate the public mind.

Thought had been given many times to the terrible contingency of a scarcity of this raw material. The continued extension of its consumption; the possibility of a conflict with the United States; the consciousness of a dependence so exclusive, which might chance at any moment to give to foreign policy a direction hardly conformable to the demands of national self-respect; and finally a very active desire to promote colonial production, and particularly that of India, had, since 1858, led England to study the means of escaping a monopoly which might become a real danger to that country.

These sentiments had found their most characteristic expression in the formation of an association for the development of the cultivation of cotton,[2] (*Cotton Supply Association of Manchester*,) a vigilant forerunner,

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[1] It is the cause of much regret that by a series of misfortunes I was deprived of the volume (sixième) of the "Rapports du Jury International de l'Exposition Universelle de 1867, à Paris," which contained the jury report upon the production of cotton, while writing the report of our commission upon that topic, and did not see it until my work had gone to press. This fact will explain, what otherwise might seem discourteous, the absence in that work of all reference to the interesting report by M. Dollfus.

For the satisfaction of our readers, especially the American planters, a translation of the jury report, with its statistics, is here given almost entire.—B. F. N.

[2] The Cotton Supply Association was founded in 1856. Its object, to use its own expression, is to develop as soon as possible, and by all sorts of means, the fitness of countries other than the United States to produce cotton, and it has energetically performed this duty. A voluntary subscription to meet its expenses was raised for 1866-'67 to 42,000 francs, which amount was expended in the purchase of seeds and gins for distribution in the distant countries; in the printing of information and advice to planters; in the getting-up of petitions to obtain or hasten the construction of means of communication, and other great works in India; and in the expenses of administration and correspondence.

An idea can be formed of the extent of the relations of the association by the figures of

possessing in the highest degree the energy, the capacity, and the activity of association, produced spontaneously in England, when great difficulties are to be conquered; but until 1860 they had not obtained "effective" results, because public opinion was but partially interested.

It is difficult, indeed, to make foresight concur with the logic of economical laws, when applied to prediction of events contingent, or at least to the accidental. The most justifiable fears, the most urgent appeals had to remain unheeded in view of the moderate cost of cotton from the United States; based upon excellence in qualities, advantage of proximity, and the habits of daily exchange mutually favorable.

The crises of 1861–'65 found England and the continent unprepared; the markets, it is true, held over large stocks from the two most productive cotton seasons which had ever occurred,[1] but were without visible resources for replacing them.

The first efforts which had been made for the development of cotton culture could not be fruitful in important results. Very rarely had the stocks in the ports been more considerable,[2] and the uncertainties relative to the duration of the strife, the inexperience in the matters of culture, the habit of dependence upon another routine, and the very natural idea that the most favorable lands for cotton-growing had been already occupied, could not fail to be the attendants of this beginning.

Changes of crops and methods of culture are accomplished very slowly and with caution; they are consequently unfit to satisfy new and sudden wants. Besides, the culture of cotton is one of the most delicate; there are few plants which have so many enemies; there are few which depend so much upon the experience of the planter, the climate, and the nature of the soil. What more natural than the hesitations which marked the years 1861 and 1862?

The years 1863 and 1864 witnessed more commendable and more decisive efforts everywhere; industry, in spite of its distress, found capital available for the promotion of cotton-planting and for advances to planters. Companies were formed, but these attempts, very limited in view of the object sought to be obtained, and impeded by divers circumstances, attained nowhere a magnitude to compensate for, or neutralize the effects of, the enormous deficiency which existed in the supply from

1,140 letters and appeals for information received in 1867, from the following countries: India, Java, New South Wales, Queensland, Feeje, Friendly islands, Navigators' Islands, Hayti, Jamaica, Montserrat, Tobago, and other parts of the West Indies; Brazil, Argentine Republic, Peru, and other parts of South and Central America; English Caffraria, Cape Coast, Algeria, Syria, Egypt, Bursa, Belgrade, Beyroot, Constantinople, Smyrna, Cyprus, Latakia, Bagdad, Scutari, Jaffa, *Caiffa*, Greece, Ionian islands, Russia, Trieste, Vienna, Genoa, Turin, Naples, Terranova; that is to say, its relations embrace the whole world

[1] Crop of the United States, 1859–'60 .... 4,662,000 bales.
Crop of the United States, 1860–'61 .... 3,656,000 bales.

[2] Stocks in the ports:

End of the season, { Ports in America, September 1, 1859–'60 ...... 1,472,000 bales.
Ports in Europe, October 1, 1860–'61 .... 1,102,000 bales.

the United States. We then saw the prices of cotton, after a short period of hesitation, rise successively under the impulse of immense speculations, since dearly expiated, and attain their highest range in October, 1863, at the price of 29½ pence (or 3.09 f.[1]) per pound for middling New Orleans at Liverpool, and 3.85 f. for bas Louisiana at Havre—that is to say, prices more than four times their normal value.

Here are shown the fluctuations or average prices in each year of New Orleans middling cotton at Liverpool, according to Messrs. Hollingshead & Co.:

From October 1 to September 30.

Years.	Francs per kilog.	Pence per pound.	Years.	Francs per kilog.	Pence per pound.
1853-'54	1.30	5.60	1861-'62	3.43	14.81
1854-'55	1.31	5.63	1862-'63	5.34	23.04
1855-'56	1.39	6.	1863-'64	6.67	28.38
1856-'57	1.80	7.80	1864-'65	4.73	20.47
1857-'58	1.65	7.14	1865-'66	4.06	17.53
1858-'59	1.63	7.03	1866-'67	2.98	12.85
1859-'60	1.53	6.61	1867, (October)	1.97	8.50
1860-'61	1.77	7.68			

See, again, the extreme prices of bas Louisiana in Havre at different periods:

Approximate prices per 50 kilograms at Havre.

Years.	Lowest, in francs.	Highest, in francs.	Years.	Lowest, in francs.	Highest, in francs.
1860	82	103	1864	310	382
1861	94	150	1865	190	343
1862	145	160	1866	165	257
1863	245	385			

It does not come within the scope of this note to develop the gradual and fatal consequences of an increase of price without precedent, placing the calicoes and prints of the working classes at the high prices heretofore held by the finest tissues, inverting old relations by making Liverpool a market of supply for American manufacturers,[2] quadrupling the cost while unsettling the value of products, and monopolizing among the most privileged the inadequate resources available for preventing the partial or complete stoppage of thousands of industrial establishments.

[1] One has to look back to 1814 to find in England the price of 30 pence (or 3.15 f.) and to 1806 in France to find that of 5 francs the kilogram.

[2] Re-exportation of cotton from Liverpool to the United States and Canada, 1863: American, 3,580,050 kilograms. Indian, and others, 2,937,150 kilograms. Total, 6,517,200 kilograms.

The phases of this crisis belong to the history of cotton manufacture, and we will notice only two features—the admirable resignation of the working class, deprived of work for want of cotton, and the brotherly assistance bestowed in England[1] and France by all classes of society; the remarkable bearing of French industry, and particularly that of Alsace,[2] which has known how to keep constant activity in its workshops.

The object sought by our work should be to state the quantity of cotton available to-day for the general market in comparison with that received in 1860–'61, before the war in the United States, and to determine, for each producing country of ancient or modern date, the part which it has contributed to the general supply during the last six years. We shall seek to establish these figures and complete them by a comparison of the respective qualities and an exhibit of the prices at different epochs of the exceptional period that we have under consideration. Before all we should make reservations as to the relative signification of some of our tables. Let it be understood that the quantities absorbed by consumption are not equal to the quantities produced, as expressed in statements of the crops.

It is admitted that no positive idea exists of the actual production of cotton in India, the estimates of statisticians differing widely, some being twice as large as others. The consumption of that country itself is immense, and this consumption varies according to the price. The same facts are repeated in the Levant on a more limited scale. Italy itself, so near us, does not give the exact figure of its production. Russia imports a certain quantity of cotton overland from Asia.

On the other hand, to avoid the arbitrary estimates habitually given of the consumption in the American manufactories, we have for many years vainly sought to obtain the number of spindles worked in the United States. Hitherto unable to obtain this information, we were upon the eve of the decennial census, which perhaps would have instructed us, when the war broke out. Under these circumstances attention ought to be fixed less upon the production of the world than upon the importation in Europe. We will make it the basis of our deductions.

The English statistics and those so remarkable which M. Ott Trümpler, of Zurich, communicates so liberally to his friends, and of which we have made great use, are made out in bales of average number of pounds. We have adopted the same units, which will be converted into kilograms in all cases where this conversion will offer special interest.

[1] In England, where the factories were sooner and more generally stopped, 457,000 workers received help before the end of 1863.

[2] Forget not, especially, that if so many establishments in Alsace and other places were enabled, not without great sacrifices, to be exceptions to the common rule by continuing full work, it was only by the aid of the raw material left at their disposal by the equal standing still of other wheels of industry.

Here follows the average of weights by pounds according to the Liverpool brokers, (the English pound equal to 0.4531 kilograms:)[1]

Average weight of bales of cotton.

	1861.		1865–'66.		1866–'67.	
	Lbs. Eng.	Kilo.	Lbs. Eng.	Kilo.	Lbs. Eng.	Kilo.
Louisiana	438	198½				
Mobile	493	223½				
Georgia	440	199½	423	191½	441	200
Florida	499	226				
Georgia, (sea island)	338	153				
Brazil	180	81½	160	72½	174	79
Egypt	430	195	492	223	490	222
East Indies	380	172	375	170	370	167½
China and Japan	....	....	240	109	326	147¾
Other sorts	200	90½	230	104	230	104

Average weights of all sorts imported into England.

	Pounds.	Kilograms.
1859	421	190.75
1860	421	190.75
1861	415	188.
1865–'66	365	165.35
1866–'67	371	168.10

Having these preliminaries adjusted we can proceed to our inquiry, applying it directly to the sorts other than those of the United States.

II.—COTTONS OTHER THAN THOSE OF THE UNITED STATES.

GENERAL IMPORTATION INTO EUROPE.

Two seasons before the American war, (seasons from 1st October to 30th September:)

	Bales in 1859–'60.	Bales in 1860–'61.
Cotton from India	700,000	782,000
Cotton from other countries*	292,000	276,000
Total	992,000	1,058,000

* These cottons were principally those of Brazil and West Indies, including a small portion from Hayti, Central America, and the South Seas.

Average of the two years, 1,025,000 bales.

In the face of a consumption which was then more than 4,000,000 bales, the figures of 292,000 and 276,000 bales, averaging 284,000 bales, presented but a feeble interest. Let us see what they have become:

[1] These are the figures given in the original. It is usual to regard 0.4536 kilograms as the equivalent of the avoirdupois pound.

General importation into Europe of the same sorts:

Importation, by bales, into Europe.

	Bales in 1865–'66.	Bales in 1866–'67.
Cotton from India	1,992,000	1,524,000
Cotton from Brazil	518,000	481,000
Cotton from China and Japan	19,000	9,000
Cotton from Egypt	248,000	228,000
Other sorts, from Turkey, Italy, West Indies, Central America, South Seas, Persia, Algeria, and Africa	397,000	359,000
Total	3,174,000	2,601,000

Importations of Europe before and after the war in the United States.

Annual consumption.	BEFORE THE WAR.					AFTER THE WAR.						Average difference.	
	1859–'60.			1860–'61.		1865–'66.			1866–'67.				
	Weight per bale.	Thous'nds of bales.	Thous'nds of kilog.	Thous'nds of bales.	Thous'nds of kilog.	Weight per bale.	Thous'nds of bales.	Thous'nds of kilog.	Weight per bale.	Thous'nds of bales.	Thous'nds of kilog.	Thous'nds of bales.	Thous'nds of kilog.
From India	380 lbs / 172 k	700	120, 400	782	134, 504	375 lbs / 170 k	1, 992	338, 640	370 lbs / 167½ k	1, 524	255, 970	1, 017	169, 503
From Brazil	180 lbs / 81.5k	127	10, 350	141	11, 491	160 lbs / 72.5k	518	37, 555	174 lbs / 79 k	481	37, 999	365	26, 856
From Egypt	430 lbs / 195 k	135	26, 325	105	20, 475	492 lbs / 223 k	248	55, 304	490 lbs / 222 k	228	50, 616	118	29, 560
From other sorts	200 lbs / 90.5k	30	2, 715	30	2, 715	230 lbs / 104 k	416	43, 264	230 lbs / 104 k	368	38, 272	362	38, 053
		992	150, 790	1, 058	169, 185		3, 174	474, 763		2, 601	382, 157	*1, 862	263, 972
Export from the United States for Europe, and the unconsumed stocks held over	....	3, 774	....	3, 126	....	....	1, 565	....	....	1, 475	....	....	....

* 1, 862, 000 bales weighing 263, 972, 000 kilograms.

The report of the jury of the Exposition at London estimated as follows the consumption of Europe in 1860–'61:

Imported from—

	Kilograms.
United States	716,000,000
East Indies	92,000,000
Egypt	27,000,000
West Indies	10,000,000
Other sorts	5,000,000
	850,000,000

or 4,388,000 bales, averaging, at 188 kilograms, 825,000,000 kilograms only.

We proceed to put in comparison the European consumption in 1861–'62 and 1862–'63, the years when the least American was used and when consumption fell to its lowest point.

Consumption 1861–'62, (applying the average weights of 1861 in the absence of others:)

		Kilograms.
From the United States	562,000 bales, at 192 kil	107,900,000
From India, (East)	1,090,000 bales, at 172 kil	187,500,000
From Egypt	164,000 bales, at 195 kil	32,000,000
From Brazil	122,000 bales, at 82 kil	10,000,000
Other sorts	55,000 bales, at 90 kil	5,000,000
	1,993,000 bales	342,400,000

Consumption, 1862–'63:

		Kilograms.
From the United States	133,000 bales, at 192 kil	25,500,000
From East Indies	1,464,000 bales, at 172 kil	251,800,000
From Egypt	227,000 bales, at 195 kil	44,200,000
From Brazil	160,000 bales, at 82 kil	13,100,000
Other sorts	162,000 bales, at 90 kil	14,600,000
	2,146,000 bales	349,200,000

See again the figures of 1866–'67, which indicate a well-marked turn back to the normal situation:

		Kilograms.
From the United States	1,548,000 bales, at 200	309,600,000
From the Indies	1,592,000 bales, at 167½	286,600,000
From Egypt	315,000 bales, at 222	47,700,000
From Brazil	450,000 bales, at 79	35,500,000
Other sorts	342,000 bales, at 104	35,600,000
	4,147,000 bales, or	695,000,000

at 168 kilograms, average would be 696,700,000 kilograms.

To complete this statistical exhibit, without pretending to be rigorously exact, which is impossible, but at least with a sufficient degree of

approximation, we will give here the analysis of the 368,000 bales of other kinds than those of the following countries: America, the Indies, Brazil and Egypt, imported to Europe from the 1st October, 1866, to the 30th September, 1867, viz: Importations in England, 153,000 bales; importations direct to the continent, 225,000 bales; total 378,000 bales, from which to deduct 10,000 bales re-exported from the continent to England. (The cottons of Naples and Sicily, which remain in the places of production, or which went to other parts of Italy by Genoa and Leghorn, do not appear in this table.)

IMPORTATIONS INTO EUROPE, 1866–'67.

Analysis of the 368,000 bales of other sorts.

From—	Ports of England.	French ports.	Other ports of the continent.	From—	Ports of England.	French ports.	Other ports of the continent.
	Bales.	*Bales.*	*Bales.*		*Bales.*	*Bales.*	*Bales.*
Peru	53,000	14,000	....	Algiers	....	4,000	....
Central America	43,000	20,000	44 000	China and Japan	19,000	....	....
Persia and Malta	28,000	77,000	58,000				
Italy	....	6,000	2,000	Total	143,000	121,000	104,000

From the preceding tables we have the following results:

1. That the total consumption of Europe, stated at 850,000,000 of kilograms for 1860–'61, is reduced, by the effect of high prices, to 349,000,000 kilograms in 1862–'63, and to 342,000,000 kilograms for 1861–'62, which, taking the average of these two quantities, shows a diminution of 505,000,000 of kilograms, or nearly 60 per centum of the consumption in the normal year 1860–'61. It has again risen to 694,000,000 for the year 1866–'67, which shows a diminution yet of 156,000,000 of kilograms, or 18 percentum below that of 1860–'61.

2. That the quantities which have been contributed to the general supply by the countries formerly productive and those of new and accidental culture during the two years since the war, 1865–'66 and 1866–'67, amounted to only 31 per cent. of the consumption during the two normal years 1859–'60 and 1860–'61 before the war, thus:

Countries formerly producing cotton—

	Kilograms.
20 per cent., India	169,500,000
3 per cent., Brazil	27,000,000
3½ per cent., Egypt	29,500,000
	226,000,000
Countries newly producing—	
4½ per cent	38,000,000
Total	264,000,000

or 31 per cent. of the consumption in the normal year 1860–'61, of which 26½ per cent. from old cotton-producing countries, 4½ per cent. from countries where the culture is accidental or wholly new.

It should be noted that we have included among the countries of accidental or irregular culture the Levant, Italy, Malta, Persia, West Indies, Algeria, Spain even, and many other countries which, before the secession war, contributed their quota, more or less, according to the course of the day, to the supply of the European markets.

A more minute analysis exhibiting the extent of the temporary capacity of supply by the countries not usually productive, and the rank of those (other than the United States, India, Brazil and Egypt) which contributed to the supply of the 368,000 bales imported into Europe in 1866–'67, is given in the official table, placed in the order following:

	Bales
Turkey, Greece, Persia, Malta, Italy, &c	171,000
West Indies and Central America	107,000
Peru	67,000
China and Japan	19,000
Algeria	4,000
	368,000

which arrangement assigns to the Levant the first rank among the countries of secondary production.

To sum up, we find that British India has brought the most effective aid to Europe in her distress, and that this aid, or excess of their usual exportation, has only been the equivalent of 20 per cent. of the normal cousumption of Europe, the remaining 11 per cent. being furnished in three nearly equal parts by Brazil, Egypt, and the countries where cotton culture is new.

This proves, in the matter of cotton-growing, that if the productive faculties seem to be in some sort indefinite with the stimulant of high prices and the infinite areas which remain accessible to this culture, time (that is to say, a sustained confidence in the maintenance of these high prices and the delays inseparable from a culture both difficult and touching, under certain relations to industry, the important process of cleaning from seed) is an element with which it is necessary to reckon—more, even, than with the success of the plant itself and that which it will always carry, whatever may be done—the inevitable hindrances to the restoration of an equilibrium too rudely broken.

III.—STATISTICS OF PRODUCING COUNTRIES.

In the second part of this report we shall follow summarily the countries which are the principal producers of cotton, in the different phases of their culture, before and after the war, in giving, with the indications of the prices of these last years, some details upon the qualities of the products.

A general table, recapitulating the production for these last years of cotton dearth, will end our work.

UNITED STATES.

The American statistics have naturally been interrupted by the war. We borrow the following figures, which offer some interest in spite of the vacancies, from the Circular of Mr. Wm. P. Wright, of New York:

Statistics of production and consumption in the United States.

	Apparent crop.	Consumption in the north.	Consumption elsewhere.	Total consumption in the United States.
	Bales.	*Bales.*	*Bales.*	*Bales.*
1866–'67	1,9951,988	*573,367	280,672	854,039
1865–'66	2,151,043	540,652	126,640	667,292
1860–'61	3,786,986	650,557	193,383	843,740
1859–'60	4,675,770	762,521	185,522	978,043

* Mr. Wright's figures follow the tables of the New York Shipping List, which, in its division of the American consumption in 1866–'67, erred by assigning to the northern consumption 135,000 bales less than the actual, and a corresponding excess to the consumption elsewhere.—B. F. N.

By these figures it may be seen what a terrible shock the American culture received (fallen, they say, to 500,000 bales for 1863–'64, and 300,000 for 1864–'65) since the crop formerly supplied an annual average of 4,000,000 bales; that it attained in 1866–'67 to only 2,000,000 of bales, and that it is estimated at only 500,000 bales more for the following season.

Let us state that the beautiful long staples of Georgia have wholly disappeared from the market. The classes 1, 2, 3, are completely exhausted, and as the islands of Georgia and Carolina, alone capable of producing the most beautiful kinds, have been from the first devastated throughout, it is probable that the fine specimens, results of a culture wholly artificial and of seed selected of the best, year after year, will not be restored for two or three years. The manufacture has, however, known how to satisfy its necessities by spinning the grades less fine; but the prices, 80 to 100 pence the pound English, (24 francs the gross kilogram,) paid for the choice Georgia sea island cotton, will not the less remain a testimony of an unheard-of and exceptional penury.

BRITISH INDIA.

A memorial address by the Cotton Supply Association of Manchester gives the following details: the sum paid to India for cotton has risen from less than 88,000,000 francs in 1860 to more than 705,600,000 francs in 1864; more than 630,000,000 francs were paid to India in 1865, and more than 636,000,000 in 1866.

Here we give the comparison of productions:

GREAT BRITAIN ONLY.

Five years before the war.

Year.	Importation.	Official value.	
	Bales.	*Pounds.*	*Francs.*
1856	463,000	3,572,000	89,300,000
1857	680,500	5,458,000	136,450,000
1858	361,000	2,970,000	74,250,000
1859	510,700	3,939,000	98,475,000
1860	563,200	3,373,000	84,325,000
Making an annual average of	....	3,862,000	96,575,000

Five years following the beginning of the war.

	Importation.	Official value.	
	Bales.	*Pounds.*	*Francs.*
1861	986,000	9,459,000	261,475,000
1862	1,072,439	22,042,000	551,050,000
1863	1,223,700	34,700,661	867,516,525
1864	1,399,500	38,214,723	955,368,075
1865	1,266,520	25,005,856	625,146,400
Making an annual average of	....	25,884,646	647,116,150

Prices were quoted as follows at Liverpool for *fair Dhollera*, (Hollinshead's Circular) for the kilogram, and in francs: 1859–'60, 0.46 francs; 1860–'61, 0.57 francs; 1861–'62, 1.03 francs; 1862–'63, 1.83 francs; 1863–'64, 2.45 francs; 1864–'65, 1.47 francs; 1865–'66, 1.42 francs; 1866–'67, 1.06 francs.

According to the *Annales du Commerce Extérieur*, the importations of India cottons direct to France have been, in—

	Metrical tons.
1860	1,828
1861	2,407
1862	2,989
1863	9,339
1864	12,617
1865	9,645

Added to which should be all the cotton (Indian) received from London, from Liverpool, and by transit for Switzerland and the Zollverein, the figures of which we have not at hand.

Of cotton from India consumed.

	By all Europe.	By England.	By the continent.
	Bales.	*Bales.*	*Bales.*
1859–60	592,000	207,000	385,000
1862–'63	1,464,000	905,000	559,000
1866–'67	1,592,000	815,000	777,000

The samples of cotton from the Indies, grown from American and Egyptian seed, have, in several experiments, proved that with more care and better processes of culture, India can realize vast progress in the improvement of qualities.

A considerable step has been taken in many districts; they will be still more decisive because of the appointment of agricultural commissioners who know the language of the country and the character of the natives. Already the government of India has named one for the districts of the central provinces and the Berars, and it is a question of extending the same measure to the presidency of Madras, including Coimbatore, and at Scinde for the parts more to the north.

English industry, by its variety of manufactures, has, more than that of France, the opportunity to use profitably the cottons of India in their imperfect state, as well as when properly cleaned, as they may appear in market; however, thanks to improved machinery, a rapid and considerable progress has at the same time been made in our country in the use of these common sorts, and we believe that their use advantageously acquired will continue, and, to a certain degree, aid the establishments producing coarse fabrics.

[The remainder of the section treating of the cotton culture in India is devoted to a description of the public works for irrigation—"Grands travaux d'irrigation"—and an enthusiastic statement of their actual and possible benefits for both transportation and irrigation. Want of space compels its omission here.]

EGYPT.

The importation of this excellent sort of cotton, suitable for the spinning of numbers of yarn, fine and half fine, (from 50 to 120) but often used for medium numbers, (28 to 40,) in consequence of the scarcity of American cotton, had been as follows in Europe before the war:

	Bales.
1856–'57	204,000
1857–'58	124,000
1858–'59	159,000
1859–'60	266,000

Annual average 188,250 bales, of 430 pounds English, (195 kilograms)=36,660,000 kilograms.

We have seen the consumption of Europe raised successively to—

	Bales.
1862–'63	227,000
1863–'64	124,000
1864–'65	374,000

of 490 pounds, English, (222 kilograms) 83,000,000 kilograms.

England is said to have received 365,000 hundred-weight, English, in 1861, or 18,250,000 kilograms, against 1,580,000 hundred-weight, English, in 1865, or 79,000,000 kilograms.

These remarkable results were due to the natural richness of the soil, and to the propitious measures decreed by the Viceroy; exemption from contributions for the new lands devoted to the culture of cotton, gifts of seeds, grants of the use of the steam-ploughs and other perfected agricultural machines, employment of better gins, all had been put to work for the encouragement of this cultivation. But it is only necessary to say that the first power moving this important increase had been, there as elsewhere, the high price of this raw material. Fair Egyptain ("*jumel fair*") which was worth in Liverpool, the principal market for its importation, 1 franc 96 centimes the kilogram in January, 1861, rose to 6 francs 80 centimes in October, 1863. There was in this extraordinary advance a premium which could not but stimulate the production; it has been indeed greatly developed, but it would have been much more so without the epidemic which ravaged the country in 1865–'66.

The quality of the staple varies from one season to another, and depends much in the whole crop upon the general conditions that may favor or impede the plant to the time of its maturity; the finer and higher the quality sought to be produced, the more it is subject to these variations. With this reservation it may be admitted that, contrary to what often happens, the extension of this culture and coincidently that of the relative production by "feddan," the agrarian measure (or division of lands) of Egypt have not impaired the quality of cotton there. The effect of the epidemic in 1865–'66 was shown in the temporary lowering of the quality; but on the other hand, the perfected cotton-gins of Platt had given to consumption a better cleaned material properly handled, (that is, without broken staples; and the use of these gins is made so common by the erection of vast establishments for their construction, that the McCarthy gin is no longer found in market,) which indicates for this operation a marked superiority over the same grade cleaned by the Egyptian mill or by the roller gin, these means of cleaning the cotton from the seed being now the exception. * * *

BRAZIL.

We designate under this generic name cottons of diverse qualities and values, which, by the use of different methods of cleaning from the seed, are rendered even more dissimilar in market. Taking the crops throughout, the cotton of Brazil (the types of which have heretofore been repre-

sented by the Bahia and Pernambuco cottons) have rather depreciated in value. One seldom fears to employ the saw-gin to obtain a mistaken economy from the expenses of cleaning saved, and a larger net weight, without ceasing, on the other hand, to leave in the cotton, as cleaned by other processes, a certain proportion of seeds which the buyer takes for cotton. We hope this last abuse will cease.

The sorts of Brazilian cotton which come upon the European markets, are the Aracati, Bahia, Céara, Camouchi, Pernambuco, Parahyba, Minas, Maceio, Maranham, Para, Rio Grande.

The price before the war was 8½ to 9 pence, or 1.75fr. to 2.10fr. the kilogram.

The price at the moment of highest cost was 29 pence, or 6.70fr. the kilogram.

Before the war Europe received only the following quantities from Brazil:

1856–57	165,000 bales.	1859–60	127,000 bales.
1857–58	124,000 bales.	1860–61	96,000 bales.
1858–59	116,000 bales.		

of 180 pounds, or 81.5 kilograms each=7,800,000 kilograms.

The consumption of these cottons, (of which England has taken two-thirds,) under the force of circumstances, has risen successively to—

1861–62	122,000 bales.	1864–65	324,000 bales.
1862–63	160,000 bales.	1865–66	423,000 bales.
1863–64	208,000 bales.	1866–67	450,000 bales.

of 174 pounds, or 79 kilograms each=35,500,000 kilograms.

It has, then, more than quadrupled.

The whole of the vast territory of the Brazilian empire is suitable to the culture of cotton; but it is chiefly the south (albeit it is the north which now exports) which supplies the finest qualities, of which that of Rio Grande should be cited before all. It is agreed by all that this culture is susceptible of an immense development.

OTHER SOURCES OF PRODUCTION.

A quantity of 368,000 bales, or in weight 4½ per cent. of the 850,000,000 kilograms of cotton which Europe consumed in 1860–'61—such is the account of what has been produced by the efforts made to introduce cotton culture in new countries, and to extend it in countries where it had already existed on a small scale. It is at once little and much; little, if compared with the wants to be satisfied; much, if we take account of the difficulties overcome! It is the fact, that in this culture the capacity to produce is far from being a pledge or giving assurance of production. The conditions of capital, of skill, and labor; those even of political or administrative regulation, play parts of an importance nearly equal to the influences of climate and geographical situation.

It would be difficult to say at present which will be the new countries

permanently acquiring the cotton culture; but there are some where it will infallibly extend, because there it succeeds perfectly. Queensland and Tahiti stand in the first line for their long staples (*soies.*) As to those countries where the culture has been a long time established and developed, as in the Indies, Brazil, and Egypt, it is evident that from them will be received the most important assistance in a time of scarcity.

The further we advance in our task the more difficult it becomes to follow each country in its successive steps of progress in the cotton culture. The extent of a work of this kind will be better understood, and the absence of interest which would attach to it if pushed to its extreme limits, when it is known that, in addition to the sources of supply to which Europe habitually looks, there happen to be one hundred and seventy-one places of production, and that in observing the arrivals in the ports we constantly learn of new ones.

We will then only pause a moment at those which, like Turkey and Greece, are too near us not to feel the effect of our stimulations to a larger production, and in closing we will devote a few lines to our colonies.

TURKEY, GREECE, PERSIA, MALTA, ETC.

Importation into Europe, 163,000 bales in 1866–'67.

In an address to the Sultan in July, of this year, on the occasion of his visit to England, the Cotton Association congratulated him that the exportation of cotton for England, from the states of his dominion, had increased from 41,212 hundred weight, (2,060,600 kilograms,) which it attained in the year 1862, to 223,000 hundred weight, (11,150,000 kilograms.) There had been, as there ought to be, under the influence of repeated encouragements, a very considerable increase, independent of an improvement of quality, from the use of better gins and seeds. The steps accomplished in respect of quantity would have been even more conspicuous but for the extreme haste attending the shipments.

Especially was there very great improvement upon the cotton of Salonica, Volo, and Pirée, both in staple and cleanliness. The contributions from Smyrna and Syria have equally presented good results, whereas the cotton from Egypt and Algeria has, on the contrary, left something to be desired in respect both of strength and length (of fibre.) The cottons of Cyprus are not improved.

ITALY.

Importation into France:

In 1861, in 1,000 kilograms	30
In 1862, in 1,000 kilograms	37
In 1863, in 1,000 kilograms	441
In 1864, in 1,000 kilograms	
In 1865, in 1,000 kilograms	3,150

Estimate of crops: Manchester, upon the Italian data given, valued that of 1863 at 89,000 bales of 100 kilograms;[1] an exaggerated figure. For 1865, the estimate was 8,500,000 kilograms. These statistics want exactness. The mills of the country retain a good part of the cotton which grows at their doors.

Here are yet further figures that we owe to a house in Naples, who regret their inability to give only approximations:

1. Before the American war we estimated the production of the Neapolitan provinces at 1,335,000 kilograms; that of the Sicilian provinces the same; say, together, 2,670,000 kilograms.

2. In 1864 and 1865, we estimated the production of the Neapolitan and Sicilian provinces each at 4,450,000 kilograms; together, say, 8,900,000 kilograms.

Whereas the exportation (it being relieved of the duty imposed upon the foreign article) in 1864 was 2,581,000 kilograms, and in 1865 it was 4,005,000; the remainder has thus been consumed at home, especially by the mills in the north part of Italy.

SPAIN.

The decrees of 1810 and 1811, which regulated the right of admission for cotton and wool into France, treat with comparative favor the cottons of Naples (Castellamare) and those of Spain, (Motril;) but the differential duties disappeared in 1814, and soon with them the names even of the Castellamare and Motril cottons, which the generation that preceded us had heard so often while the continental system endured.

We have mentioned the resumption of the cotton culture in Italy. It was in 1865 only that it appeared to have had a place at Motril, a small port near Grenada.

They estimate the crop of 1865–'66 at 630,000 kilograms; of 1866–'67 at 840,000 kilograms; and it is supposed that the crop of 1867–'68 will attain to 1,000,000 kilograms.

The larger part of these cottons have been spun by an establishment at Malaga. Only a small quantity has been shipped to England, and none of it to France. It is sold at the current price of Egyptian, with which it corresponds in quality.

Some cotton has been grown at Iviza, (Balearic Isles,) and sold to the spinners at Barcelona.

These appear to be the limits of the attempts at cotton culture in Spain.

[1] Weights of bales fictitious, for the bales of Castellamare are reckoned among the heaviest that appear in market.

FRENCH COLONIES.

The following are the quantities taken for consumption in France, for the several years and the places of production, (in kilograms:)

	1861.	1862.	1863.	1864.	1865.
Algeria	246,000	134,000	157,000	413,000	560,000
Guadaloupe	....	....	....	105,000	242,000
Martinique	....	....	....	....	50,000
French India	65,000	187,000	....	639,000	304,000
Sénégal Corse, pour mémoire	....	....	....	....	....

The importation of cotton from Algeria constituted in 1860 and 1861 only .05 (five hundredths of one) per cent. of the general importation; but this quantity, so insignificant in appearance, represented not less than five or six per cent. of the manufacturing demand for fine cottons, long staple, and has rendered precious service. So we shall be happy to see realized the hopes which depend upon the great works of damming destined to bestow upon Algeria the means of irrigation, indispensable to ts cotton culture, so often compromised by drought.

Guadaloupe, which has produced about one-half less than Algeria, appears to be stopped in its attempts; and it is grievous, for its fitness to produce the finest sort of long staple remains undisputed.

Guiana, Cochin-China, Senegal, Corsica, even our own departments du Midi, which had for a time believed they could enter the lists, forgetting that they lacked two months of sun, are not outside the limits of attempts more or less successful, of which the results are too limited to enter into statistics.

IV.—SOURCES OF SUPPLY OF THE VARIOUS KINDS OF COTTON EMPLOYED IN MANUFACTURES, 1864 TO 1867.

[Long-stapled sorts are marked *.]

Alabama.............United States.
Arica................*Peru.
Aricati..............*Brazil.
Adenos..............Levant.
Arkansas.............United States.
Angola...............West Africa.
Algeria..............*Africa.
Armenia..............Asia.
Acre, (St. Jean d')....Syria.
Akoot................Hindostan.
Banda................*Dutch possessions.
Barbadoes...........*Antilles.
Bahia................*Brazil.
Broach...............Hindostan.
Bourbon.............*French possessions.
Bermuda.............*English possessions.
Bahamas.............English possessions.
Bownuggur...........Hindostan.
Barri.................Italy.
Bagdad..............Turkey in Asia.
Ceylon...............British India.
Candia...............Archipelago.
Camptah.............Hindostan.
Cassaba..............Smyrna, (Levant.)
Caraccas.............*Central America
Cyprus...............Levant.
Céara................*Brazil.
Candahar.............East Indies.
Carthagena..........*Venezuela.
Coimbator............Hindostan
Côte Ferme.
Cumana.............*Central America.
Castellamare.........Italy.
Cayenne.............*French Guiana.

China.
Camouchi .... *Brazil.
Carolina .... United States.
Cuba .... *Spanish Antilles.
Casma.............. *Peru.
Caramania .... Turkey in Asia.
Cephallonia .... Ionian Isles.
Cote d'Or .... Senegal.
Caucasus .... Asia.
Constantinople .... Turkey.
Cocanadah .... Hindostan.
Catania .... Italy.
Calabria .... Italy.
Dhollerah .... Hindostan.
Dharwar .... Hindostan.
Demarara .... *English Guiana.
Dardanelles .... Turkey in Europe.
Elias .... *Peru.
Feejee Islands......... -
Florida .... *United States.
Francavilla........... Italy.
Georgia, (uplands) .... United States.
Georgia, (Sea Island). *United States.
Guadalonpe .... *Little Antilles.
Guayaquil .... *Ecuador.
Grenada .... Spain.
Galles of the Sonth.... East Indies.
Hayti................ *Grand Antilles.
Hinghenghant......... East Indies.
Jumel .... *Egypt.
Jamaica .... *West Indies.
Idelep .... Syria.
Java .... *Isles of Sunda.
Japan .... Asia.
Jujures .... ———
Jumhoreer .... Hindostan.
Kandish .... Hindostan.
Kircagach............ Levant.
Kurachee .... Hindostan.
Kinick .... Levant.
Kirekly............... Hindostan.
Louisiana .... United States.
La Guayra........... *Venezuela.
Lagos .... Africa.
Liberia .... Africa.
Livadi............... Greece.
Loanda .... Africa.
Latakia............... Syria.
Majorca .... *Spain.
Manjalore .... *Hindostan.
Minas .... *Brazil.
Macedonia .... Turkey.
Malta................ English possessions.
Maceio .... *Brazil.
Mételin .... Turkey.
Madras .... Hindostan.
Martinique.......... *Little Antilles.
Mobile............... United States.
Maranham .... *Brazil.
Mazzara.............. Italy.
Marocco .... Africa.
Nevis .... Little Antilles.
Navigator's Island .... Polynesia.
Nasca............... *Peru.
Naplouse............ Syria.
Natal................ Africa.
New Orleans .... United States.
Nicaragua........... *Central America
Oomruwuttee........ Hindostan.
Philippine islands ..... South Seas.
Payta .... *Peru.
Persia .... Asia.
Pisco .... *Peru.
Paraiba .... *Brazil.
Porto Rico .... *Antilles.
Para................ *Brazil.
Puerto Cabello....... *Venezuela.
Paramaribo.......... *Dutch Guiana.
Piræus .... Greece.
Pouille .... Italy.
Pacchino.............. Italy.
Pernambuco......... *Brazil.
Queensland .... *Australia.
Rangoon .... India.
Realejo .... *Central America.
Rio Grande .... *Brazil.
Red Western .... Madras.
Rio Hacha .... *South America.
Rarotonga .... South Sea islands.
Surat .... Hindostan.
Smyrna .... Turkey in Asia.
Senegal.............. Africa.
Surinam .... *Dutch Guiana.
Sonboujeac........... Levant.
Scinde .... East Indies.
Somanco............. ———
Salonica .... Turkey.
Syria .... Asia.
Shanghai .... China.
Salem .... *Hindostan.
Sciacca .... Italy.
Siam .... *Asia.
Singapore............ Asia.
Seychelles............ Indian ocean.
Sardinia............. ———
South Seas........... ———
Tahiti .... *Society Islands.
Tobago .... English Antilles.
Tinnevilly .... Madras.

Tennessee	United States.
Tortola	*Antilles.
Trinidad de Cuba	*Spanish Antilles.
Texas'	United States.
Toomels	Hindostan.
Tarsus	Turkey in Asia.
Tripoli	Barbary states.
Trebizond	Asia.
St. Thomas	*Danish Antilles.
Tunis	Barbary States.
Terranova	Italy.
Tampico	Mexico.
Tarranto	Italy.
Uruguay	South America.
Virginia	United States.
Varinas	Venezuela.
Venezuela	*South America.
Volo	Macedonia.
Weraoul	Hindostan.
Yucatan	*Mexico.
Zante	Ionian Isles.
New Zealand	English possessions.

The foregoing catalogue concludes the section of the jury report by M. Dollfus upon the *production of cotton.*

This catalogue is given in full here because it is nearly identical in extent and details with the list of samples of the cotton of all countries exhibited at the Paris Exposition of 1867 by the Manchester Cotton Supply Association, and with the excellent collection of samples supplied to the United States Commission to the Exposition, by the courtesy of the same association, as described in the first part of this report.

PARIS UNIVERSAL EXPOSITION, 1867.
REPORTS OF THE UNITED STATES COMMISSIONERS.

REPORT

ON

SILK AND SILK MANUFACTURES,

BY

ELLIOT C. COWDIN,
UNITED STATES COMMISSIONER.

WASHINGTON:
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CONTENTS.

SILK AND SILK MANUFACTURES.

SIR: The undersigned, Commissioner of the United States, and member of the Committee "on Raw Materials and Manufactures of great use or displaying remarkable skill or merit," to whom has been specially assigned the subject of silk and silk manufactures, respectfully submits the following Report:

Silk, by its characteristic qualities and unchangeableness, as well as by the richness and beauty of its appearance, is in relation to textile substances what gold is to metals.

It is of all filamentary substances that which gives the finest, most durable, and most elastic threads. Its tenacity is about equal to that of good iron; that is to say, a thread of silk of the same size will support nearly the same weight before breaking, and the textile matter affords an elasticity superior to that of the mineral substances.

Silk consequently unites the most brilliant properties with the most solid qualities. Its various, excellent, and advantageous characteristics have made it an object of research in all ages by the different nations of the world.

ANTIQUITY OF THE USE OF SILK.

China, even in our own day the most important country for the production of silk, appears to have been its cradle at the most remote epoch. The Chinese annals attribute to the Emperor Fau-Hi the merit of having employed silk in the manufacture of musical instruments of his own invention 3,400 years before the Christian era.

The Empress Si-Ling-Chi was the first to invent silk tissues, 2,650 years before our era, which invention contributed so immensely to the prosperity of her country that she was placed among the Chinese divinities, under the name of Sien Thsan,[1] and even now the Chinese empresses offer annually solemn sacrifices to her memory.

As it is the habit of the emperor of China once a year to plough the earth in order to add dignity and honor to agricultural pursuits, so in like manner the empress, by annually visiting the silk-worm nurseries and laboring with her own hands, encourages the production of this valuable commodity.

Two centuries before the Christian era the Chinese carried on a commerce in silk with Persia, Greece, and Italy. Their caravans or troops of dealers were protected by military settlements or colonies.

The generic name given to this precious material has remained

[1] This name means *the first promoter of silk industry.*

unchanged except with a slight modification of the word. In fact the French word *soie* or *silk* bears among them the name *sec.*

The Mongols name it *sirke*, the Mantchous *sirche*. The Russians designate it by the word *chek*, and the Greeks by *sez*, &c.

Notwithstanding the antiquity of the use of silk, its nature was for a long time unknown, and its importation into the west was of recent date compared to its high antiquity in Asia.

The history of the introduction of the first eggs of the silk-worm into Constantinople during the reign of the Emperor Justinian is well known.

The Chinese, determined to retain the monopoly of the silk industry, forbade the exportation of the eggs under penalty of death. They were, nevertheless, obtained A. D. 552, by two Persian monks, who had lived a long time in China as missionaries, and were acquainted with the rearing of silk-worms. Stimulated by the gifts and promises of the Emperor Justinian, they succeeded in conveying a large number of eggs concealed in hollow canes to Constantinople, where they watched their hatching and the development of the butterflies. The breeding of silk-worms spread, however, very slowly in Europe. The Moors imported them into Cordova about the year 910. Greece and Italy undertook it in the twelfth century; thence this branch of industry passed to Marseilles. At the commencement of the 14th century Pope Clement V introduced it into Avignon. Under Henry IV, Sully established a silk-worm nursery in the garden of the Tuileries. Louis XIV continued to encourage this enterprise in France, though with but slight success, so far as relates to the production of cocoons and the spinning of silk.

The weaving of silk goods with foreign thread had, on the contrary, already made marked progress in France, and had a great development, which it preserved even up to the revocation of the edict of Nantes, after which period the weaving as well as the spinning of silk lost ground considerably.

The emigrants carried this beautiful industry into England, Germany, and Switzerland, and raised the most active competition against France, where manufactures of silk remained in a languishing condition up to the close of the great revolution at the end of the last century, and until shortly before the return of peace to Europe.

RISE AND PROGRESS OF SILK INDUSTRY IN THE UNITED STATES.

America has not been insensible to the efforts made by other nations to appropriate to themselves the production of silk.

During the early periods of the colonization of Virginia, James I, on several occasions, advised with and encouraged the London Company in regard to the cultivation of the mulberry tree, and addressed a letter to the company in which he enjoined its members and exhorted the planters to apply themselves with diligence to the breeding of silk-worms, to establish silk-worm nurseries and spinning grounds, and to devote their

activity rather to the production of this rich commodity than to that of tobacco, to which he manifested a profound aversion. Upon this advice, they planted a large number of mulberry trees, but collected little silk, in consequence of the difficulties resulting from the speedy dissolution of the London Company.

However, the culture of the mulberry was resumed in Virginia about the year 1651. The tree was indigenous in the colony, and the enterprise was so far advanced in 1660 that the coronation robe of Charles II was the product of the silk-worms of Virginia. But the steady advance of tobacco culture caused the business so to decline that it seems to have almost disappeared by the close of the century.

During the 18th century efforts were made to introduce silk husbandry into all the American colonies. It had been started, as early as 1718, with some success, in Louisiana, then under the dominion of Spain. The most strenuous exertions were directed to Georgia. Private gifts co-operated with acts of Parliament, and its settlers were stimulated by grants of land to cultivate the mulberry and raise silk-worms. In 1732, artisans, skilled in this industry, were sent over from Europe. The French emigrant who had charge of the business proved treacherous, and destroyed the machinery, eggs, and trees, and fled from Georgia.

The Italian who succeeded him was more trustworthy, and some raw silk was soon exported to Europe. In 1735 a beautiful robe was made in England of Georgia silk, which Queen Caroline wore on a great state occasion.

In 1740 the export of cocoons reached 1,000 pounds, and their product commanded the highest prices. A large silk establishment was soon erected in Savannah. The cocoons annually delivered to it, in the years from 1758 to 1766 inclusive, ranged from 10,000 pounds to 15,000 pounds, and in the latter year they reached 20,000 pounds. During the same period the annual export of raw silk ranged from 500 pounds to 1,000 pounds. At this period the silk culture was one of the most flourishing and profitable in the colony. But its success was of short duration. After 1766 the governmental bounties were withdrawn, and this industry began to droop. The storm of the revolutionary war prostrated it. After the peace, the planters of Georgia turned their attention to the growing of cotton, and silk culture utterly and finally disappeared.

The experiment in Georgia, its rise, progress, and decline, are the history of silk culture in all the colonies. Brief notices of some other colonies must suffice.

In South Carolina silk-growing was prosecuted before the Revolution, and for a time flourished. The mother of the celebrated Pinckneys carried some silk, produced on her plantation, to England, where it was woven into tissues. Gowns were made of it and presented by her to the mother of young George III, and to the elegant Earl of Chesterfield. But the same causes that uprooted the business in Georgia, destroyed it in Carolina. It passed away on the advent of cotton-raising.

Silk husbandry received early attention in Pennsylvania and New Jersey. The British government aided it by liberal bounties. Dr. Franklin, while in Europe in 1770, sent home mulberry cuttings, silk-worms, eggs, &c., for distribution, and, with other influential citizens, gave it much encouragement.

In 1771 a silk establishment was set up in Philadelphia, which, during a series of years, received a large amount of cocoons. A lady of Lancaster county raised cocoons from which a piece of silk, fifty yards in length, was manufactured. From this a court dress was prepared for the Queen, who sent from Windsor Castle, in return, a handsome present to the fair donor on the banks of the Susquehanna.

Large mulberry groves flourished at Princeton, New Jersey, and cocoons of excellent quality were produced in encouraging quantities. But, as in the south, the convulsion of the Revolution, unusually severe in Pennsylvania and New Jersey, prostrated this branch of industry, and, though efforts were made after the peace to revive it, they were not specially successful.

Massachusetts and Connecticut took the lead in this enterprise in the east. It received the fostering support of the authorities. Governor Law, in 1747, appeared in a silk coat and stockings of home production. A few years afterwards President Stiles, of Yale College, officiated at Commencement in flowing robes of Connecticut silk. In 1770, Boston and New Haven vied with each other in raising cocoons, and in spinning, dyeing, and manufacturing raw silk.

A flourishing manufactory of sewing-silk was established at Mansfield, Connecticut, before the Revolution. Ipswich, Massachusetts, was at the same period noted for its silk products; while the largest and finest mulberry nursery in the country was growing at Northampton.

All these enterprises suffered by the blight which fell upon all industrial pursuits during the revolutionary war.

Silk husbandry and manufacturing had almost ceased to exist in the United States at the commencement of this century. Since then they have not kept pace with the advance in kindred pursuits.

Nevertheless, they have always been prosecuted to an encouraging extent in various parts of New England, New York, New Jersey, and Pennsylvania, as, for example, Mansfield, already referred to, has done a large business in sewing silks, and produced, in 1839, five tons of the raw material. Washington, Pennsylvania, always kept up the business. It was introduced into the State prison at Auburn, New York, in 1841, and the first year the product of sewing silk was about $13,000. It was steadily increasing in the country, when, some 25 years ago, its growth was checked by a disastrous speculative furor in the *morus multicaulis* shrub, which, for a few years, raged through the Union like an epidemic. The reaction fell heavily upon the whole business, covering it temporarily with odium and ridicule. It has since been slowly recovering from this season of delusion and folly.

In 1840 the product of silk raised in the United States was estimated at about 60,000 pounds, valued at $250,000. In 1844 it had increased to about 400,000 pounds, worth $1,500,000. By the census of 1850, when the effect of the speculative mania alluded to had culminated, the annual product was reported at only 14,763 pounds. Then it began to revive, and by the census report of 1860 it appears that the manufacture of sewing silk was carried on extensively in Connecticut, New Jersey, Massachusetts, Pennsylvania, and New York, the States being named in the order of the value of their products.

The annual production in those States, including tram, organzine, &c., was placed at upwards of $5,000,000.

Ribbons were made to a small extent, as were also silk stuffs. But, aside from sewing silks, the chief silk manufacture consisted of ladies' dress trimmings, coach laces, &c., of which the cities of Philadelphia and New York are reported as producing about $2,300,000. Since 1860, the business, in all its departments, has made steady progress, and the current period is more favorable than any previous one for its energetic prosecution.

Our country is specially fitted for silk culture. The experiments in Georgia and South Carolina proved that their soil and climate were peculiarly suited to it. May we not hope that, after a lapse of eighty-five years, it will be renewed in those States, and be prosecuted successfully not only there, but also in all the middle latitudes of the Union, whose rich soil, genial sun, and dry atmosphere are admirably adapted to the cultivation and manufacture of this beautiful and useful article?

But, though the possibility of the success of this kind of industry has been demonstrated in a great number of localities in America, it is probably to the Pacific coast that we are to look for its greatest triumph. Among the finest cocoons exhibited at the Exposition were specimens from California. They were perfect in form, and remarkable for their white, silvery hue. The soil in the valleys of California is proverbially fertile, and mulberry trees are produced of the richest and most luxuriant growth.

Its dry, warm, equable climate makes it vastly superior for silk husbandry to France or Italy. In European countries the rain and dampness destroy a much larger percentage of the grubs than on the Pacific coast. An intelligent and enterprising French emigrant, who is enthusiastically prosecuting this industry at San José, declares that the humidity and electricity of Europe destroy from 25 to 75 per cent. of the silk-worms, while under the dry, elastic skies of California few ever perish. These considerations in a measure compensate for the higher wages of American labor.

There are other savings in this industry as compared with its prosecution in Europe. In California there is no necessity for artificial heat to hatch the eggs. To transfer them from the cellar to the garret and

expose them to the beating of the sun's rays is sufficient. Nor need the cultivator run the risk of the "baking" process, so liable to dim the lustre of the silk. The powerful rays of the sun for a few hours will stifle the chrysalis, render the cocoon ready for the spinner, and preserve the brilliancy of the material.

California eggs are already highly valued by foreign silk-growers. Cultivators are diffusing them along the Pacific coast. A considerable capital is invested in the silk business. The largest cocooneries are at Santa Barbara. An important experiment is now being made there by energetic parties, who have already 10,000 mulberry trees, and have produced the present year (1867) upwards of 300,000 cocoons of excellent quality.

An enterprising company is erecting an extensive factory at San José, to be furnished with all necessary machinery, including some forty looms, for producing taffetas in all colors and of the best qualities.

May we not hope that the day is not far distant when the plains that *slide down* from the western base of the Sierra Nevada will become as famous for beautiful silks as its gorges have long been for precious metals and its valleys are now becoming for cereals?

The nationality of the commission from which this report emanates must furnish the excuse for dwelling so long at the outset upon the subject of silk culture and manufacture in the United States. It will be resumed in brief terms near the close of the report. As germane to the American branch of this subject, it may be stated in this connection that silk culture was recently commenced in the republic of Ecuador. Its soil and climate are said to be wonderfully adapted to the growth of the mulberry and the rearing of the grub, especially in the neighborhood of Quito.

The first eggs were imported from France in 1859. The first exported to France was in 1865, where the eggs were highly esteemed, and were wholly exempt from the peculiar disease prevailing in Europe. Like its vegetation, silk culture in Ecuador can flourish the year round.

The food required by the worms is only half as much as in Europe, because of the superior richness of the leaves and the more favorable condition of the climate. The number of mulberry trees now growing in the republic is nearly a million. Labor is abundant and excessively cheap. The promoters of this enterprise in Ecuador indulge sanguine hopes of success. No doubt considerable portions of South America are well adapted to this department of industry.

REARING OF SILK-WORMS.

Numerous observations made by French and Italian scientific agriculturists and silk husbandmen show:

First. That the culture of the mulberry tree and the breeding of silk-worms is possible up to a limit very far advanced northwards, a limit fixed by the frequent occurrence of a temperature of 77° Fahrenheit.

Second. The limit of the culture of the mulberry does not pass beyond that of the cultivation of the grape, and the culture of the former is possible wherever the latter will thrive.

Third. The mulberry can be raised upon the sides of the mountains of Europe up to the point where the mean temperature of the year is 49° Fahrenheit.

Fourth. Climates habitually stormy are not congenial to the breeding of the silk-worm.

Fifth. Places afflicted with fevers (proving the existence of marshy emanations) are pernicious to the silk-worm.

Sixth. This industry is to be considered rather as an adjunct to a large farm than as a chief occupation.

To these principles, given as the natural conditions necessary or hurtful to the industry of silk husbandry, are to be added the not less important questions of the price at which it returns from the hand of the workman in each locality, and of the abundance and scarcity of manual labor. We must, however, remark that the insufficiency of worms and their high price during more than ten years, in consequence of the malady of the precious grub in Europe, allow a remuneration sufficiently high to cover the expenses of the dearest hand labor, especially if we consider that the duration of care and attention which the harvesting of the worms demands does not exceed six weeks, counting from the day of hatching to a period after the warehousing of the cocoons, which latter, according to the best systems in use in Italy and France, can be reeled during the whole year.

PRODUCTION OF RAW SILK.

The production of the cocoons is essentially an agricultural industry, and the winding off the cocoons into raw silk may be considered as semi-manual and in part automatic. All the other transformations of the silk, from the throwing to the making of the stuffs, are entirely mechanical.

It can hardly be possible that henceforth the United States will not take a large share in the immense industrial and commercial movement to which silk has given rise in the world.

Certain countries, such as Italy and France and the oriental nations in general, employ themselves with all the transformations of silk, from the culture of the mulberry and the breeding of the worm to the manufacture of tissues.

England, (and others follow her example to a limited extent,) although not producing silk on her own soil, yet carries on a most important commerce in that article, by means of her colonies and powerful marine. She develops with equal activity the spinning or throwing of silk thread and the weaving of silk goods.

In a word, nations such as the United States, Switzerland, and Northern Germany, which are almost exclusively manufacturers, confine themselves to the transformation of silk bought in markets more or less distant.

The aptitudes of manufacturing nations change or are materially modified from time to time. Russia, for example, could, but recently, hardly be ranked among manufacturing nations. The people of that great empire are now making not only rapid progress in the industrial arts, but they have advanced in the south of Russia, on the Caucasus, even to the breeding of silk-worms.[1]

The production of the silk-worm in that country, since the annexation of trans-Caucasian Asia for example, has been three-fold, though the silk is far from being worked with the requisite care; it being generally irregular and suited only to the most common productions.

In 1865 this part of Russia exported nearly 30,000 kilograms, or 66,155 pounds,[2] representing a sum of about 1,560,000 francs, ($312,000,) that is to say, at the price of about 52 francs the kilogram, whilst that of France and Italy sold for at least double that price.

It is thought that the total silk production of Russia amounted to about 88,000 kilograms, or 194,054 pounds, estimated at a value of about 4,576,000 francs, ($915,200.) This result is far short of the limit which may be ultimately attained both in regard to quantity and price.

Germany and Switzerland have the same tendency, whilst France, the different States of Italy and Spain, in consequence of the scourge which attacked the production at its source some years ago, are becoming almost entirely manufacturing countries, and benefit India and the extreme east by their increasing wants.

The United Kingdom of Great Britain alone seems to profit by fluctuations so unfavorable to the rest of Europe, and even to America.

English ships go to collect in China, in Japan, at Calcutta, Bombay and elsewhere, the eggs or *graines*, cocoons, silk, and the *waste*, to sell again. After having first directly supplied her own manufactories, the surplus is disposed of to her neighbors in Europe; she thus profiting by the transport, warehousing, commissions, brokerage, &c.

Silk forms one of the principal articles of commerce in the business transactions of England with the extreme east.

The following table will show, as near as can be ascertained, the value of raw silk produced annually in the various countries of the earth, and its vast importance as an element of national wealth:

Asia	$141,000,000
Europe	73,480,000
Africa	220,000

[1] The culture of the mulberry tree, the introduction of which into Russia dates from the period of Peter the Great, remained without any great results up to the commencement of the present century.

[2] The metrical system being in use in most of the countries from which we have derived our information, and constantly tending to extend itself more and more, especially since the international conference at Paris, we have thought it useful and proper to retain in part, for the numbers cited, the franc as the unit of money and the kilogram as the unit of weight.

Oceanica	$120,000
America	80,000
Total	$214,900,000

These amounts may be divided as follows, viz:

Chinese empire	$81,200,000
Japanese empire	17,000,000
Persia	5,000,000
The island of Asia Minor	5,200,000
Syria	1,800,000
Turkistan (in China)	400,000
Turkistan (independent, in Asia)	1,400,000
Corean archipelago	100,000
France	25,600,000
Italy	39,200,000
Turkey in Europe	7,000,000
Spain and Portugal	3,200,000
Pontifical States	1,300,000
Greece, Ionian islands	840,000
Morocco, Algeria, Tunis, Mediterranean coast	300,000
Basin of the Danube, Austria, Bavaria, Servia, Hungary	1,280,000
India	24,000,000
America	80,000
Total	$214,900,000

These figures have been greatly reduced during the last few years, as far as concerns the production in Europe. The difference, however, was made up by the quautities received from China, India, Japan, and the Levant.

But those *exotic* silks are far from being as highly esteemed or as valuable as those of Europe.

The modification in the relative value of silk which has taken place during a century is worthy of note.

A century ago nearly all the silk, or at least five-sixths of the quantity manufactured by French fabricants, came from foreign countries, from the Levant, from Persia, Sicily, Italy, and Spain.

The other sixth only was produced in the south of France. The mean price of French silk was 15 francs the *livre*, or 30 francs the kilogram, ($2\frac{1}{5}$ pounds.) Exotic silks were much dearer. The most common foreign raw silk, that of Greece, then brought 120 francs the kilogram; China and India silks, 240 francs; and that of Italy was valued at from 500 to 600 francs.[1] But by degrees French silk improved to such an extent

[1] These are the prices as published in the price current of the Amsterdam market, where at that period the greatest quantity of foreign silk was sold.

that, in the early part of this century, the price advanced to 70 francs the kilogram. This rate was maintained almost without variation up to the year 1840; while foreign products were depreciated to such a degree, that the very best quality from the Levant and from Persia sold at 40 francs and the waste at 32 francs.

Italy during this period maintained the elevation in its prices, on account of the very excellent quality of its silks. That was nevertheless surpassed by the French silks, which finally rose from the last to the first rank, which they still maintain.

The raw silks of France, of the first quality, at a later period brought 150 francs, while those of the best kind from Italy realized hardly 100 francs. These results are due entirely to the progress in French manufactures, which has hardly contributed to the extraordinary development of the silk industry that has occurred in that country.

This specialty of silk industry has given to France the importance that the cotton industry has to England.

In this connection it may be profitable to give a rapid sketch (so far as data will permit) of the progressive development of silk culture and manufacture in the principal countries of Europe and Asia. The amounts are given in round numbers, and though obtained from trustworthy sources may be liable to some corrections.

In 1789 France produced 1,000,000 pounds of raw silk. Near the close of the century she consumed about 1,200,000 pounds of silk thread, from which she manufactured from $3,000,000 to $4,000,000,[1] (15,000,000 to 20,000,000 of francs.) Of this she purchased about $1,400,000 (7,000,000 of francs) from other countries. The stock of stuff goods consequently amounted to from $4,400,000 to $5,400,000, (22,000,000 to 27,000,000 francs,) of which France exported about one-half to foreign countries.

In 1812 France produced 600,000 pounds of raw silk and 340,000 pounds of organzine, valued at $5,000,000. The same year she imported 900,000 pounds, valued at $6,750,000.

In 1820 it is estimated that French manufacturers transformed $10,000,000 (50,000,000 francs) of materials, of which one-half was furnished by the southern departments. The goods produced from these materials represented a value of more than $20,000,000, (100,000,000 francs,) of which $14,000,000 (70,000,000 francs) were consumed at home, and $6,000,000 (30,000,000 francs) were exported.

As first in importance we begin with France.

PROGRESSIVE DEVELOPMENT OF SILK INDUSTRY.

FRANCE.

In 1812 the silk looms in seven of the principal towns of the empire numbered 27,000. In 1824 Lyons alone had nearly 25,000. In 1839 the number in Lyons had increased to 40,000, and in the whole kingdom to

[1] Dollars at *gold* valuation in all cases.

85,000, employing about 170,000 workmen. In the latter year the entire production was estimated at $46,300,000.

In 1850 the business had largely increased. The value of raw silk grown in the kingdom was $28,000,000, (140,000,000 francs.) The capital employed, $50,000,000, (250,000,000 francs,) the amount imported being $22,000,000.

The silk goods produced were valued at $75,000,000, (375,000,000 francs,) of which about one-third were consumed at home and two-thirds exported.

In 1855 the value of silk goods sold was estimated at $106,500,000, of which about $26,500,000 was imported. The home consumption was $35,000,000, and the export was about $71,500,000. The number of silk looms in the empire was about 225,000. The number of persons engaged in this industry was upwards of half a million.

In 1860 the value of French silks amounted to upwards of $140,000,000, (700,000,000 francs,) and yet this was not sufficient to supply the demand. France purchased in foreign countries $40,000,000, (200,000,000 francs,) chiefly of piece goods, velvets, and ribbons. Of this $180,000,000 France exported about $110,000,000, (550,000,000 francs.)

These totals were reduced at the outbreak of the American rebellion. France restricted to a marked degree her purchases of silks. The United States purchased from France of silk tissues alone, in 1859, $27,600,000, (138,000,000 francs;) in 1860, $20,800,000, (104,000,000 francs,) but in 1861 only $5,000,000, (25,000,000 francs.)

Subsequently the business increased, the Lyons exports of silks to the United States in 1865 amounting to $9,900,000, and in 1866 to $6,000,000.

Though the rebellion has been suppressed, the fiscal measures resulting therefrom still have their effect upon the silk husbandry and manufacture of France, operating as they do at the same period with the scarcity of indigenous silk, and the prevalence of mysterious disease among the silk-worms, which has by no means disappeared, and to which special reference will be hereafter made.

GREAT BRITAIN.

When the Duke of Parma sacked the city of Antwerp, in 1585, its silk artificers fled to England, carrying with them their experience and skill in this novel branch of industry. It was encouraged by the English government, but the humid climate being unfavorable to the rearing of the grub, it was not specially successful.

On the revocation of the edict of Nantes, in 1685, some 75,000 of the most skilful artisans of France took refuge in Great Britain, among whom were a large body of silk weavers, who settled in Spitalfields, (then a London suburb,) and under the fostering care of the Crown they and their children plied their vocation with success for a century and more, some of their descendants remaining in the same locality to this day.

For 30 or 40 years after immigration England was wholly dependent

on foreigners for organzine silk thread, but in 1718 Mr. Lombe, an English capitalist, visited Piedmont disguised as a common laborer, took sketches of silk-throwing machinery in use there, and on his return erected an extensive mill at Derby, which produced more than 3,000,000 yards of organzine per day.

For many years raw silk was largely imported. Acts of Parliament were passed from time to time stimulating its manufacture, and the business was steadily advancing, when, in 1764, on account of low wages, scarcity of work, and the preference shown for French silks, the weavers of Spitalfields and the silk operatives of other localities assembled, in a tumultuous manner, and petitioned Parliament for the total prohibition of foreign-wrought silks. The commotion was kept alive by combinations of operatives for several years, till, in 1772, it broke into open riots, which convulsed London many days, the final result being the passage of prohibition laws, which after trial proved unsatisfactory.

This system of prohibitory legislation continued till 1824. A high English authority has declared that "the manufacturer, depending upon the protection of parliamentary restrictions on foreign competition rather than on his own skill and exertions, was not anxious to discover and introduce improvements into the manufacture." And he states that "since the change of system the imports of the raw material and the exports of the manufatured article have rapidly increased." In 1825 the English silk looms numbered about 24,000; in 1855 they had increased to more than 110,000, consuming about 5,500,000 pounds of thrown silk, and producing goods to the value of near $45,000,000, besides a considerable amount of spun silk, and goods of which silk constituted a part.

In 1855 England consumed of her own silk manufactures more than $35,000,000, while she imported about $20,000,000. In 1860 the value of her silk manufactures was estimated at some $90,000,000. On account of the extreme dampness and chilliness of her climate, (of which mention has been made,) she raises no silk-worms, but imports the raw material.

In 1856 the value of her imports of raw silk was (omitting fractions) $32,000,000, and in 1867 $58,000,000. It fell off in 1858 on account of the "panic," but again revived. Nearly one-half the amount of the raw material came from China, and a large share of the balance from her East India possessions.

During the three years just mentioned England imported $1,300,000 of thrown silk, more than one-half being from France, and nearly one-third from China.

In 1860 the British consumption of raw and thrown silk was 9,420,417 pounds; in 1861, 8,125,982 pounds; in 1862, 9,706,202 pounds; in 1863, 8,182,645 pounds; in 1864, 7,541,578 pounds; in 1865, 6,492,720 pounds; and in 1866 it was but 5,273,767 pounds.

In 1823 Great Britain exported of silk goods only $702,000; in 1844 it exported $3,682,000; in 1856, $14,800,000; in 1858, $11,950,000; in 1861, $11,560,900; in 1865, $10,886,000.

Thus we see that this great manufacturing nation, notwithstanding by its uncongenial climate deprived of the capacity to successfully produce the raw material, has long prosecuted a large business in the transformation of this beautiful article, though now seriously checked in many branches of its silk industry by the effect of the recent treaty with France.

What an instructive lesson is thus taught to the citizens of our country, where everything combines to render the prosecution of this industry pre-eminently successful.

OTHER EUROPEAN COUNTRIES.

Italy was early famous for its silk culture and manufactures. In Milan and vicinity, in the year 1800, about 2,000,000 pounds of raw silk were said to have been collected. In 1825 the quantity was estimated at 2,700,000 pounds, valued at \$10,000,000; in 1858 at 5,400,000 pounds, worth \$30,000,000. In 1825 Piedmont produced about 1,500,000 pounds of raw silk of the very highest quality. In the same year Tuscany, Naples, the Romagna, and Calabria produced 1,500,000 pounds, also excellent in quality. In 1851 an Austrian official document stated the productions in the Austrian dominions of Italy at \$21,700,000 in raw silk, and \$14,200,000 in manufactured silks. In 1855 the total of both kinds of silk in the whole Italian peninsula was stated at upwards of \$60,000,000. A considerable portion is consumed at home, and the remainder exported chiefly to Germany, France and England.

Spain produced in 1842 about 2,000,000 pounds of raw silk, three-fifths of which was raised in Valencia. About 400,000 pounds were manufactured at home, and the rest exported. The Spanish cocoons are excellent, but much of the reeling is defective. Valencia silks, where great care has been taken in the manipulation, are famous for their magnificence.

In Prussia silk manufacture is rapidly increasing. The number of looms in 1831 was 9,000; in 1837, 14,000; in 1855, 25,000; and in 1865 not less than 40,000. In the Exhibition were superb silks, velvets, velvet ribbons, black silk ribbons, mixed and unmixed silk fabrics of various descriptions, from Crefeld, Elberfeld, Viersen and vicinity. The waters in that locality, especially those of the Wipper, hold in solution salts specially adapted to secure permanency and brilliancy to the colors employed in manufacture.

Austria is engaged somewhat extensively in silk manufacture, but since she relinquished her Italian dominions this industry has doubtless received a check.

The product of Switzerland in 1858 was placed at \$20,000,000. The "Collective Exhibition of the Zurich Manufacturers" of black and colored silks, plain and figured, and the "Collective Exhibition of the Basle Silk Ribbon Manufacturers," as shown in the Exposition, evince the progress and perfection to which Swiss skill in silk industry has now attained.

Russia has already been alluded to. After France and England, the nations that come in the order of their importance in respect to silk

manufactures are Switzerland, Prussia, Austria, Italy, and Spain. France maintains a great superiority over all in her rich and artistic productions; but in plain goods, and those of a secondary quality, she finds serious rivalry in British, Swiss, and German industry. Switzerland is becoming remarkable for her activity, her constant progress, and her improvements in material interests.

In a subsequent part of this report the occasion will be embraced to examine the improvements she brought to the Exposition, since there is a great analogy between the situation and industrial genius of that republic and the social and manufacturing condition of the United States.

ASIATIC COUNTRIES AND AFRICA.

China raises, manufactures, consumes, and exports a vast amount of silk. It is impossible to estimate the quantity consumed at home. A high authority declares that, of her 400,000,000 of people, a large proportion, excepting the lowest classes, are clad more or less in silk fabrics. She exported to England alone, in 1858, nearly 10,000,000 pounds. In the East India Company's possessions the product is large. In 1857 they exported to England about 4,500,000 pounds. Persia produced great quantities, much of which is consumed at home. The amount raised in Syria and Asia Minor is some 2,500,000 pounds per annum, of which a large share is exported to France and England. Reference to other Asiatic countries, of inferior importance in this particular, is omitted.

Silk has long been produced in small quantities along the African shores of the Mediterranean. England imports some of the raw material from Egypt, but the greatest share of the productions of the Nile region is consumed at home. Tripoli produced in 1842 about 130,000 pounds. The islands of Cyprus and Crete raised in 1856 some 50,000 pounds.

SPECIALTIES OF SILK INDUSTRY.

The labor in silk comprises seven distinct branches, forming as many different industries, even when a single manufacturer conducts several in one establishment. These specialties are—

1. The breeding or rearing of silk-worms, called in France the art of the *magnanier*, (or silk-worm breeder.) This word comes from *magnan*, the name given to the grub of the white mulberry in the south of France.

The appellation *magnanerie*, or silk-worm nursery, is given to the locality where the worms are hatched, fed, and attended to from their birth till they have formed their silky envelope or cocoon.

These silk-worm nurseries are generally established in localities or countries favorable to the cultivation of the mulberry tree, of whose leaves, and white fruit especially, the worm is particularly fond; and also where the temperature is regular and moderate. Nevertheless, this last condition is not indispensable. It is replaced artificially by special means of warming and ventilating, so as to maintain at will, constantly, the temperature between 70° and 75° Fahrenheit, and thus be able to breed

numerous little grubs; (one ounce, or 30 grams, contains about 40,000, while from 20 ounces 800,000 have been obtained at a time, in the same place.) The result is arrived at chiefly by watchfulness in ventilation, in removing the vitiated air and replacing it by pure air.

The art of the silk-worm breeder embraces what is called "the fabrication of the *graine*," or, more correctly, of the eggs to be used in the reproduction. The cocoons destined for this function are the only ones whose chrysalis or grub is allowed to be transformed into the butterfly. These are moistened, and then the grub opens one of the lengthened extremities of the cocoon, and issues from it.

Then the grubs are collected by pairs, male and female, to permit fecundation before the laying of the eggs. These *fecondés*, suspended on paper or cloth, are subsequently put aside until the following spring, in an atmosphere of even temperature, and sufficiently low, like that of cellars.

This part of the art of the breeder, so simple in appearance, demands special knowledge and great care, particularly at this time, when it is so difficult to procure eggs free from the epidemic now raging among the silk-worms.

2. The second specialty in this industry is the *filature*, or reeling of the silk from the cocoons into the threads known as raw silk, and composed of fibres of a certain number of cocoons according to the size of the thread required. It is a most delicate untwisted product, but wanting in lustre on account of its containing some 25 per cent. of gum.

3. The throwing of silk, or the process of putting the raw silk into the threads required for the different kinds of weaving.

It is at the throwing that the threads are formed that figure so conspicuously at the Exposition, and also in commerce, under the names of simples, trams, and organzines. There are also other kinds of thrown silk, known as *marabouts*, *grenadines*, *crêpe*, *soie ondée*, &c., which are twisted differently from trams and organzines, for special purposes.

Let us look for a moment at the comparative value of each of these denominations. The singles are the raw silk after the first twist. The tram, or woof, is obtained by the union of two or more threads of raw silk, slightly twisted. The organzine, from which in general is made the warp, is the result of two singles twisted together.

A product of peculiar nature, frequently used in the manufacture of trimmings, is the *fil guipé*. It is composed of one or more straight threads, around which is rolled a spiral thread, the interior being generally of indifferent material, and the thread rolled around is composed of silk, gold, or silver.

4. The dyeing constitutes an important specialty, requiring the greatest possible delicacy and skill, pure water being essential to success.

5. The preparation of the threads for the loom is another separate and essential branch, requiring care and attention.

6. The weaving embraces in itself alone several subdivisions, namely,

the weaving of plain and cut silk goods; the weaving of velvets of figured stuffs more or less rich; the knitting of various articles and the fabrication of silk *blondes* or laces.

THE SPINNING OF WASTE SILK.

7. The preceding processes yield a certain quantity of *waste*, varying with the nature of the operations and the qualities of the products.

This waste is in its turn transformed from the raw state, where, after having been cleaned from the gummy matter, chiefly by mechanical means, it presents a close analogy to the strippings and windings of cotton and combed wool.

These processes are the basis of great industries which flourish in England and on the continent.

The threads thus produced vary in value from 30 to 60 francs the kilogram, according to their fineness and quality.

These branches of industry are now carried on to some extent by American manufacturers.

EXAMINATION OF THE POSITION OF EACH OF THESE INDUSTRIES, AND THEIR PROGRESS AS MANIFESTED IN THE EXPOSITION.

In the art of silk-worm breeding the question of first importance consists in the means of obtaining the *graines*, or eggs. Good eggs bear an exorbitant price. They are worth at the rate of 300 francs the kilogram, and still they cannot always be produced guaranteed against the prevailing malady, except from Japan.

The States of South America appear to enjoy the same immunity. At the commencement of the prevailing epidemic, (about the year 1846,) other countries furnished healthy eggs, but their exemption did not continue after the second or third generation. Thus it is that the United States have been led to put all silk-producing countries under contribution.

Will the eggs of Japan and of South America, at the present time so much sought after, escape this degeneracy, of which, despite the numerous investigations, we as yet do not know the cause?

But if the cause remains concealed, the preventive means begin to be more clearly established.

The following method is generally admitted and recommended by men recognized as the most competent judges, and since it is the combined result of great experience and observation, it will be read with interest in all countries which desire to encourage the culture of the silk-worm:

It is of great importance to choose for reproduction cocoons of the largest size, and those the most successfully reared and least affected with the malady during the course of their development. These cocoons are recognized by the regularity of their form, the roundness of their extremities, the fineness of grain on the surface, and the solidity and thickness of the layers or silky envelopes.

The male cocoons differ from the female by their shape and size. The former are smaller than the latter, and present a cavity upon their back. The latter are larger, presenting the figure of an olive or the egg of a small bird.

The color of these cocoons ought to be of a golden yellow after collecting, and should exhibit no spot or stain of any kind.

In the same breed, the heaviest cocoons are in general those which offer the greatest chance of affording the best reproductions. Then, after having put a certain number of male cocoons on one side and of female on the other, weigh both parts to find the average weight of each, and every time that this average weight is exceeded there is a presumption that excellent cocoons are obtained for reproduction, all other things being equal.

It is, however, necessary to remark that, as one part of the cocoons contains sometimes the same gross measurement, it should not be confounded with the normal cocoons. Cocoons of an exceptional bulk are in general the result of two grubs united under the same envelope. Their product is known under the name of "doubles," or "*douppions*," or twin threads.

This sort of product is always inferior, as much because the beds or envelopes are almost invisible, as because the association in the work indicates a weakness in the subject.

Notwithstanding all the attention and care given by the breeder to prevent the production of doubles, and sometimes even of triples, he must inevitably expect to find a certain proportion of those, the value of which is hardly one-third the price of the normal product.

There was exhibited in the Exposition an apparatus contrived by an Italian silk husbandman, designed to prevent these *douppions* in the breeding of worms.

The apparatus consists in an arrangement of cells made of very light wood, each one of which has only the bulk necessary for a single grub. When these come to their full development, ready to spin their cocoon or boll, instead of preparing heath, shrubs, or other kinds of shelter or supports against which the worms are to spin, this kind of cells is supplied where each insect has its own separate case, which prevents two or any greater number from uniting to make a defective product.

The Italian exhibitor is endeavoring to bring into general use this system of isolation or cellular breeding.

The system presents, according to the inventor, other advantages, by the facility which it offers in the choice of the best reproducers, and by preventing the coupling between grubs of the same family, consanguinity having been considered as one cause of the rapid deterioration of the breed.

When the coupling has been accomplished, the females are removed and made to lay, each in the cell reserved for her, in such a way as to be able to weigh separately the eggs of each laying.

This weight is not to be inferior to a certain ascertained proportion, for the eggs would then be evidently bad. In order that they may offer good chances of success, each laying should weigh at least 60 or 70 grams, (per kilogram of cocoons,) each gram to contain 1,350 to 1,500 eggs on an average.

THE SILK-WORM AND ITS VARIETIES.

THE COMMON SILK-WORM, *(Bombyx Mori.)*

The common silk-worm and the species mostly in use, and which produces by far the best silk, is born in the spring, ordinarily about the middle of May. It feeds on the leaves of the mulberry tree and attains its full growth in about six weeks.

During that period it changes its skin four times, and according to M. de Quatrefages, of the French Institute, increases its weight 72,000 times. Early in July, having reached its full development, it establishes the workshop of its wonderful manufacture.

Placed in a comfortable and secure position, it proceeds to envelop itself in a cocoon formed by a filament of exceedingly fine silk, emitted from the stomach of the insect. It soon disappears in the centre of the cocoon or silken envelope, and, after about 72 hours of unremitting labor, produces a thread ordinarily not less than 1,600 yards in length.

In that chosen retreat the silk-worm again sheds its skin, for the fifth time, but the insect which comes out is no longer a silk-worm, but a chrysalis—bearing but slight resemblance to the worm. After two weeks or more, according to the temperature, the skin of the chrysalis opens, and, changing for the last time, it becomes a butterfly, lays some hundreds of eggs, and dies.

Besides the *Bombyx Mori*, there are other species of silk-worms that merit a brief notice, and particularly the following:

CASTOR-OIL PLANT SILK-WORM, *(Bombyx Arrindia.)*

This species of silk-worm is a native of Bengal and of British India. It lives, both in its wild and its domesticated condition, upon common castor-oil plants and other vegetation. It was but lately introduced into Europe by means of a few living cocoons imported into Malta. Their propagation was not only successful, but was continued in Italy, whence many were sent to France and the Canary islands.

Wherever the castor-oil plant grows spontaneously, as in Algiers, Brazil and Rio de la Plata, the efforts to raise this species of silk-worm have been crowned with success. Its cocoons cannot be reeled in the ordinary way, but they furnish a staple which, when spun into threads, produces fabrics of good suppleness and durability, though almost destitute of lustre.

AILANTHUS SILK-WORM, *(Bombyx Cynthia Vera.)*

This kind of worm is indigenous to the temperate regions of China, where it lives mainly on the ailanthus. It has long been cultivated by the Chinese in the open air, and produced an elongated cocoon of a reddish shade, furnishing a kind of *bourre de soie*, from which is made a very strong and durable tissue.

This silk-worm was introduced into Europe for the first time in 1857, and into France in 1858, where the first successful rearing of it is chiefly due to Madame Drouyn de Lhuys.

But it is to M. Guerin Méneville, who, under the patronage of the Emperor, experimented extensively and with success, that belongs the credit of having given to this silk its growing importance and industrial value.

THE TUSSEH SILK-WORM, *(Bombyx Milita.)*

This notable insect lives in a wild state in Bengal, and in the hot regions of India, in the woods, where the inhabitants go to gather the cocoons, which are remarkable for their size and form. Its favorite food is the leaves of the jujube tree. Efforts have been made repeatedly to reproduce it in France, but in vain. The cocoons of this insect produce a fine and brilliant silk, and very strong, known in India as *Tusseh*, of which large quantities are exported to Europe.

THE WILD SILK-WORM OF JAPAN, *(Bombyx Yama May.)*

This worm, raised from eggs sent from Japan by the consul-general of France at Yeddo, has been successfully reared. The oak leaf and trees of the same kind are its only nourishment. It does not require great heat, and is easy to raise. Its cocoon, of a greenish yellow, is formed like that of the ordinary silk-worm, and can be reeled into a beautiful silk.

BOMBYX CECROPIA.

This description of worms, indigenous to the temperate regions of North America, is found principally in the Carolinas, Louisiana and Virginia.

In its uncultivated state it lives upon the elm, the willow, and other trees. It produces a large cocoon of a loose texture and coarse silk.

At the Exposition there was a collection of silk-worms in their different stages. A quantity of eggs, of mulberry leaves, and all that relates to the rearing of the silk-worm, were also displayed there.

The silk-worm is tender and delicate. The experiences of the last twenty years have proven that it is liable to epidemics, that rage with peculiar violence and fatality.

THE SILK-WORM MALADY AND THE REMEDIES PROPOSED.

During the period in which the disease in question has attacked the silk-worms, great research and the most minute study have been made to ascertain the cause.

Some have ascribed this calamity to the mulberry; others have compared it to a species of Asiatic cholera, or an epidemic analagous to the cattle distemper from which England and Germany have suffered so much within the last few years.

Others have asserted that the breeder had gradually departed from and neglected those healthful traditions and maxims so essential to be observed in the breeding and rearing of such delicate creatures.

The breeder, perceiving that he could abridge the period of rearing by raising the temperature of the nursery, prematurely matured unhealthy broods, and thence there arose numerous accidents, because by raising the temperature the appetite was forced, which caused derangements in the animal economy.

These different causes, more or less vague and indeterminate, may have contributed to the development of the epidemic. However, the theory of disease in the mulberry is hardly admissible, considering that it has been demonstrated that worms of different breeds or races, nourished by the leaves of the same tree, have experienced different fates. Some succeeded, the others were attacked by the disease and perished; therefore the food in these cases was innocent of the effect.

In the difficulties by which we find ourselves involved in endeavoring to determine the cause of the malady, we have only to seek out the character and seat of the evil, to be able *a priori* to reject infected subjects.

After numerous investigations by eminent men, certain spots or bodies of peculiar form and appearance were discovered, with the aid of the microscope, in the very tissues of the diseased worms at the bottom of their digestive canal, evidently foreign to their organization, and in quantities proportionate to the violence of the disease. To these little spots or bodies the name of *corpuscules* was given. They are oval, transparent, smaller than the globules of the human blood, and resemble the globules of certain fermentations.

Widely different theories prevail in regard to these corpuscules and the remedies required for their eradication. The distinguished savant M. Pasteur has come to the conclusion that it is an organic, constitutional affection of the insect, to destroy which either a specific remedy must be found, or else all the conditions favorable to the production of the corpuscules must be avoided, either by obtaining eggs from countries exempt from the malady, or by allowing none but healthy insects to propagate. He has demonstrated that contact between healthy and infected worms does not impart the disease; while, on the other hand, the absorption of a few corpuscules by feeding upon leaves washed with corpusculous water causes the epidemic to spread with incredible rapidity.

M. Pasteur is of the opinion that search must be made for the corpuscules in the chrysalis, and he developes a very ingenious method for facilitating the discovery.

He recommends the immediate destruction of all insects known to be infected, and the separation from them of the healthy ones, and enjoins the utmost cleanliness as an essential condition for the extirpation of the disease in a silk nursery.

M. Béchamp, who has devoted great patience to the investigation, propounds the theory that the disease is parasitic, and that the parasite is of a vegetable nature of the order of fermentations, and that remedies like creosote will arrest if not destroy the development of these vegetable corpuscules.

His mode of application is to wash the eggs in a solution of creosote, or diffuse an impregnating vapor through the rooms of the silk-worm nursery. Suffice it to say, that the methods recommended by each of these gentlemen for the extermination of the disease have been tried, but with only partial success; but all concur in the opinion that the eggs of diseased subjects are unfit for use, and should be rejected.

It has been demonstrated also that the grubs, the chrysalides, and the moths proceeding from the Japanese race or that of the South American states, have been to the present moment free from all trace of corpuscules and all symptoms of the disease.

Practical breeders of the south of France have made very interesting experiments, from which it resulted that the worm when hatched and bred in stables or in sheep folds generally did well.

Comparative experiments prove that the same lot of eggs divided into two parts gave products good in quality and quantity as to the half raised in the atmosphere of a stable, while the grubs of the other part bred under the ordinary conditions generally perished.

These repeated trials appear to demonstrate that the grave nature of the affliction can be modified by the alkalinity of the atmosphere which developes itself in so declared a manner under the conditions of which we have just spoken. It is a species of treatment analogous to that of the water and salt of Vichy and other thermal springs.

BREEDING OF SILK-WORMS.

The industry whose object is the production of cocoons is composed of elements so special and so different from those of manufactures in general as to require that some details be given on the subject, partly agricultural and partly manufacturing.

The basis of the labor of the silk-worm breeder is founded in general on the amount of mulberry leaves consumed. These leaves constitute in this case the raw material.

We will give some figures derived from localities where the population is relatively condensed, such as the south of France and the north of

Italy, the principal European centres for rearing the silk-worm and the mulberry.

A hectare (or $2\frac{471}{1000}$ acres) of land, planted with 2,500 mulberry trees, produces annually an average of 5,000 kilograms of leaves. The expenses of all kinds for the culture of this quantity may amount to 350 francs a year. Then the 1,000 kilograms of leaves amount to 70 francs. The 1,000 kilograms of leaves support a variable quantity of cocoons. In normal years it may amount to 60 kilograms.

Taking the 1,000 kilograms of leaves as the unit, the average expenses for feeding worms for 30 grams of eggs are as follows:

	Francs.	
30 grams of eggs, with a price very variable, are at the maximum	15 =	$3
1,000 kilograms of leaves	70 =	14
Manual labor of two persons during 40 days	160 =	32
Warming and lighting	10 =	2
Cells for cocoons, and incidental expenses	5 =	1
Total	260 =	52

The fresh cocoons are now worth at least eight francs the kilogram. It would be sufficient to obtain 32 kilograms for every 1,000 kilograms of leaves to pay the disbursements, and if the gatherings yield, as is usual in normal conditions, 50 kilograms only, this would be a gain of 50 times eight, or 400 francs, ($80,) and if one worked on a basis of one hectare of land only, this would be a gain of 400 times five, or 2,000 francs ($400) in six weeks. There were breeders in France who, before the epidemic, produced as many as 1,000 kilograms of cocoons in a single season.

APPARATUS USED IN THE MANUFACTURE OF SILK.

TOOLS OR STOCK NECESSARY TO TRANSFORM THE COCOONS INTO RAW SILK.

France and Italy are the only countries which have exhibited the apparatus necessary to transform the cocoons into threads of silk. These are the most advanced in the whole of Europe in this specialty.

The industry of Spain, of Greece, of the Levant, and of Russia, has imitated as much as possible the means used in France and Italy. Those countries have not, however, been able to arrive at the perfection of their neighbors. As to the Orientals, they lose a part of the advantages which their privileged climate gives them in regard to the production of silk by insufficiency of care and skill in details.

The implements, properly so-called, for converting the cocoons, are most simple in all countries of the world. They consist principally of a basin and a reel. The basin is used to receive the cocoons and some warm water to soften the gum of the silken envelope, so as to set free

the threads forming the exterior silky layers. The union of a certain number of these threads forms the thread of commerce known by the name of *grège*, or raw silk.

The reel, by its rotary motion, winds off the cocoons. In the factories, certain numbers of these winding machines are placed side by side, the impulsion being given to them by a single motive power. Of course the arrangement is such that the operator can, at will, stop any of these little contrivances while the others continue to work. The entirety of the operation is automatic, except that in regard to each reel we find a basin and a woman to superintend the work. The labors of the superintendent consist—

1. In the immersion of the cocoons in the warm water until the silky layers are sufficiently softened.

2. In the cleansing, with a species of brush or broom, of the first layers until they become a pure and clean thread.

3. In the uniting by pressure and twisting a certain number of threads of the cocoons in proportion to the standard of raw silk intended to be produced.

The *grège* thus formed by the union of a greater or less number of cocoons is passed through an orifice or drawing frame, which acts on the winder, whose rotation determines the development of the threads of the cocoons which remain immersed on the surface of the water in the basin, so that in proportion as the cocoons are wound off, the attendant is careful to add a new one, as much to keep up the supply of thread as to maintain the regularity of the standard.

The cocoons being conical from the commencement to the end of the winding, the *grège* would have the greatest irregularities if the workman did not conduct his work so as to connect the strongest, that is to say the commencement of the thread of the new cocoon, with those which are just being exhausted.

The threads, issuing wet and gummy from the basin, would adhere and stick together in the skein if careful means were not taken to prevent it. The preventive consists first in preserving a sufficient distance between the basin and the reel, to permit a partial drying; and second in a "guide thread" so arranged that the transport takes place by a slow zigzag movement, which prevents the threads from crossing each other at the same point at each turn, which latter causes the adhesion.

Some suggestions will assist us to understand and to obviate the difficulties in this branch of the work.

The degree of previous preparation should vary with the durability of the silky couches, having regard to the age, breed, and origin of the cocoons.

If prepared too much, the result would be that more silky matter would be yielded by the first layers than there should be. This superfluous matter would be only waste, and would possess a value much inferior to that of fine silk.

If the cocoons are, on the contrary, insufficiently prepared, they pre-

sent a resistance to the winding off, which causes the breaking of the thread, and leads to a new source of waste. The workman ought to possess great skill in joining a new thread to a thread in work. He should be competent to select the most opportune moment to assure the regularity of the product, so that the trace of these successive connections may be imperceptible to the eye, and thus avoid knots, coarseness, curls, or dots.

Nor will rare skill in these particulars produce the effect desired, unless the wheel revolves with a fixed and steady velocity of at least 500 metres per minute. Without this, the thread, instead of being smooth and brilliant, would be rough and dull.

A too slow movement would not dress the thread sufficiently, clasped, as it is, very tightly by its peculiar position and fixed under the form of the figure 8 in the layers of the cocoons. A movement too slow causes those undulations which give the dull appearance; while the development of the thread in the straight line by the more rapid movement permits the reflection of the light in those perfect and determined conditions which give brilliancy to the finest silk.

We have entered somewhat at length into these details because they will assist us to discover the many difficult sides of a question of apparent simplicity, and will enable us the better to understand why the more perfect development of this industry remains concentrated in the hands of some populations, and why automatic labor has not been able, till now, to bring about those elaborate and exquisite modifications in silk which have been produced in other textile fabrics. But if converting the cocoons into raw silk in a successful manner be due to local circumstances, such is not the case with the industrial specialties which follow it, commencing with the throwing or spinning of the silk.

Almost all European nations were represented at the Exposition by the different mechanisms employed in the silk manufacture. Let us take a glance at the machines of this character. We will first speak of the machinery used to sort and dress silk badly reeled, and it may be well to enter into some details on this subject, as it is one that particularly interests the American manufacturers.

Silk of the first quality being actually as dear as silver,[1] ought to be employed only in the best and most perfect conditions, especially when it is intended to produce fabrics like those so much admired at the Exposition, and among others the truly artistic silks of Lyons. Different means have been devised to determine the standard of the silk thread. If it be pure it will have the degree of solidity and tenacity desired. The manufacturer is particularly ingenious in constructing apparatus to rectify, sort, and dress silks of irregular standards.

[1] In spite of the high price and the crisis in silk husbandry, silk costs much less than in the time of the Romans. The Emperor Aurelian refused a silk dress to his wife, assigning as a reason that it was too expensive a luxury even for a Roman empress, silk then being sold for its weight in gold, pound for pound.

APPARATUS TO SORT, TO PROVE, AND TEST THE QUALITIES AND PROPERTIES OF SILK.

Silk thread has more need to be sorted or numbered than the thread of other substances; the sorting or numbering is to determine the relation of the unity of weight to the unity of length. For silk the unity of weight is generally the *denier* or fraction of the ancient *livre* of Montpellier, and the *denier* is equivalent to 0.53 of the *livre*.

The unit of length is 400 *aunes*, representing 475 metres, or 515 yards. Thus, when we say a silk of $\frac{8}{9}$ *deniers*, we mean that a thread of it of 475 metres of length weighs from eight to nine *deniers*.[1]

Efforts are being made to modify this standard and to substitute the unit of 500 metres for the 475 metres, and the milligram for the *denier*, in order to make the system conform to the metrical system.

The rectification of the standard of silk seems to be more necessary than that of other valuable materials, because, from the manner silk is produced, we are far less sure to arrive at regularity than by the automatic process practiced for the conversion of cotton, wool, &c.

Besides, as silk, from its nature and price, is intended for the dearest kind of products, the material employed in its manufacture ought to be so much the more perfect. The mode of *titrage* generally used in all periods consists in winding off a certain length, and the determination of the weight of this length. The less it weighs, the finer, of course, the silk will be.

It is considered, for example, that if 500 metres weigh one milligram, it will be one-half more fine than if it weighed two milligrams, supposing always that its hygrometric and thermometric condition does not change during the operations. The same unit of length will weigh more if it contains humidity than if it be perfectly dry.

The public establishments of Europe to ascertain the condition of silk have for their specific object to determine, in an exact manner, the real state of the silk, its degree of humidity, and the absolute weight of this same foreign matter, as if the silk were perfectly dry.

Establishments of this kind, it is well known, exist in the principal manufacturing centres of the trade in silk and wool. They generally operate under the direction of the various chambers of commerce.

These means of control offer a great security to business, but unhappily they can do nothing to verify or establish the regularity of the threads.

The *titrage* gives, in effect, only the relation between the weight and the length, but indicates nothing as to the homogeneity of the thread. Each determinate length of a skein may have identical weight without the thread being regular. For example, if a skein of 10,000 metres presents an equal *titre* or standard for each 1,000 metres, that would not demonstrate that upon this length there may not be parts alternately

[1] Condition publique des soies et des laines, bureau de titrage. Décret du 2 Mai, 1853.

coarse and fine. This effect happens much more frequently with the silks that are poorly worked, on account of their low relative price.

Some sellers in China, Japan, and the Levant, strive, with great persistency, to ascertain and rectify these irregularities of thread by the windings off. During this process, when the eye discovers the defects, they are removed by the hand; but this is a slow, expensive operation, and anything but sure.

The Swiss exhibition contained an automatic apparatus which arrives much more efficiently and economically at the result sought for.

THE SILK-SORTING APPARATUS OF G. HONNEGER, SWITZERLAND.

This machine receives on the one part a series of skeins of silk. To each skein correspond a number of bobbins or reels, equal to that of the varied bulk supposed to be contained in the skein.

The solution of the problem consists in collecting on each bobbin thread of the same fineness. Let us suppose five bobbins from No. 1 to No. 5. Each will receive the portion of the thread of the *titre* for which it shall have been designated. For this purpose the thread which is rendered from the skein to the bobbins is guided automatically by a mechanism for gauging, extremely sensitive, and so arranged that the *grège* or raw silk in passing acts upon a lever which directs the silk upon the proper bobbin.

The variation in the bulk of the product is the point of departure in the variation of the guide lever, which directs the thread to the reel proper to receive it.

A glance at the working of this apparatus enables us to understand it better than would the most elaborate description.

By the employment of this machine the cheap silk of the east can hereafter find still more extensive applications, and contribute to a new development in silk industry.

AN APPARATUS TO TRY THREADS BY PROFESSOR ALCAN.

Another apparatus of great utility was exhibited by Professor Alcan in the French section. It is an instrument of rare precision, very simple, not expensive, and works with great facility. Its object is to test the tenacity and elasticity of filaments and threads, and to determine the degree of tension most suitable to be employed on any given thread.

The mechanism of this instrument, though not at all complicated, has been explained in detail, with its applications, by the inventor, in several works very popular in France, particularly in his treatise upon the textile arts, one of which is entitled "On Cotton Labor," and the other "On the Manufacture of Wool."

These works of M. Michel Alcan, Professor of the *Conservatoire Impérial des Arts et Métiers de Paris* are to be obtained by the publisher, J. Baudry, Paris.

We name these works because they give a greater amount of information upon the production of raw material and upon the progress of this industry than any other works within our knowledge.

Near this machine at the Exposition is another apparatus called *Expérimentateur Phrosodynamique*, to prove threads; and also a new machine to prepare and open cotton before the ginning, both the production of Professor Alcan. This eminent engineer has made, as we have seen, a special study of the industrial questions which are of such vast importance to the American people.

IMPLEMENTS AND APPARATUS USED IN SILK-THROWING.

The machines for "silk-throwing" seen at the Exposition have remained, as far as fundamental principles are concerned, in the same general condition wherein they were at the origin of automatic industry; but they have been improved in their details, and in the harmony of their execution.

The Swiss manufacturers, especially, have exhibited a remarkable collection of implements in this department.

The assortment as thus exposed, and which is employed in the best factories, consists—

1. Of series of *tavelles* to wind, clean, and equalize the threads during their automatic winding off.

2. Of an apparatus to unite and double the threads with a mechanism for instantly stopping the machine whenever a thread breaks.

3. Of a machine to give the first twist to the double threads in the direction determined for the production of the tram or woof.

4. Of a second machine to retwist together two threads already twisted separately, thus producing the organzine.

The object of these machines, so simple in their construction, is to obtain constantly an evenly twisted product—that is to say, worked in such a manner that each unit of length receives exactly the same number of turns.

Now the realization of this object was not effected without encountering difficulties which have been completely surmounted by the Swiss and French mechanicians, judging as well from the machines as from the magnificent threads exhibited.

This class of machinery is the more advanced because the machines to convert silk are, of all others, the cheapest, and this results directly from their greater simplification.

The "throwing" the threads of silk has several objects in view.

1. It gives them a sufficient resistance to admit of their being boiled in soapy water to remove the gummy matter, so that they may receive the dye better and give greater brilliancy than if they had remained in the raw state.

2. By the ungumming the silk acquires the desired suppleness of silks called "boiled," whilst if it retained its gum it would be stiff and rough, like the silks employed in bareges, for example.

3. The throwing the silk is intended to give a certain peculiar appearance to the threads, which partly determines what is called the grain of the stuff.

Moreover, when these threads are intended for brilliant tissues, such as satins, the two successive torsions which constitute the organzine are combined in such a manner that the last, which will be the most apparent, should have the least twist in order to preserve the brilliancy of the stuff.

The combination is inverted if the object be to make threads for taffetas, gros grain, gros de Naples, &c.

The work of silk-throwing, by the combination of the varied conditions it requires, necessitates the possession of such accurate knowledge, and the use of such rare skill as to constitute it a special art.

SIMULTANEOUS REELING AND THROWING.

It has been frequently attempted, and is sometimes still sought, to unite in one single operation the winding off of the cocoons and the throwing of the silk. Notwithstanding that for a long time the solution of this problem, which apparently presents no serious difficulty, has been considered as the philosopher's stone of silk industry, the effort has not been abandoned. Still in this department, as certain mechanism exhibited by the Italians and French attest, the problem offers but little interest or encouragement; as for example, to wind off the cocoons and twist the thread at the same time, the raw silk or *grège* in issuing from the basins, instead of being passed on to the reels by one simple movement, is rolled around bobbins having a rotary motion, in order to give torsion to the threads.

It is necessary to direct two of them together upon one bobbin to produce the tram; consequently the intermediate operations are all suppressed and condensed into one single process, and hence an apparent economy; but, in fact, this economy disappears and the new mode becomes comparatively expensive, because the production is considerably reduced and because it requires a much larger personal attendance.

A few figures will suffice to demonstrate this. To produce the *grège*, the velocity most suitable is such that one workman throws out at least a length of 500 metres of thread a minute.

When the thread is twisted at the same time only 500 revolutions are given per metre to it in the majority of cases. Suppose a velocity of 3,000 revolutions to the spindles, only six metres will be produced instead of 500 a minute. It is true a workwoman can superintend four threads instead of one, but it will still be necessary to employ twenty times as many spinners in this case as when the production of the *grège* was in question.

Now this augmentation of expense is much more considerable than the economy realized by the suppression of the intermediate operations. But the most serious difficulty consists in the imperfection of the results.

The slowness of motion in the simultaneous twisting and throwing does not permit a suitable development to be given to the thread, nor a sufficient tension for the entire unwinding which causes the dark aspect of the product already spoken of.

In a word, by the combination of different operations, the workman is not able to bestow upon his task that care in cleansing and purifying which is performed by the automatic system and by hand as it exists in careful silk-throwing.

Thus the apparent progress, so enticing in appearance, demands an expense much more considerable than that of the separate operations mentioned, and can only give inferior products of inconsiderable value.

In order that they may be forewarned, these facts are worthy of special notice by the American people, who are only beginning to turn their attention to this branch of industry.

However, all new attempts may reach ultimate success; and if it be true that for beautiful normal products the simultaneous twisting and throwing must be rejected, there are cases where they may be employed, and, indeed, where they begin to be employed with a certain success; as for example, when the cocoons are of an inferior quality, and difficult to wind off, such as double cocoons, so that the operator in twisting them directly can, at the best, obtain silk of only a very inferior grade, fit only for working common *cordonnet*, (braid, binding, twist, lace, &c.) In such case the simultaneous process may be advantageously used. And, indeed, cocoons, wound and doubled and twisted simultaneously, in order to make directly from them certain products intended for *passementeries* or trimmings, have no need of such careful superintendence as would be required in regard to the same cocoons when intended to produce the more beautiful silks. A single person can attend a greater number of ends, (or *bouts*,) inasmuch as these coarse articles are far less liable to break.

There are then two conditions which permit the employment of the simultaneous system with advantage.

1. When the object to be attained is not an imperfect *grège*, but a *cordonnet* for trimmings, of a sufficiently good quality, and at a price relatively high; and 2d, in cases where the expense of hand labor is considerably reduced in consequence of the character and destiny of the special product—one person under such circumstances being able to produce very much more than he otherwise would by the ordinary process.

PRODUCTION AND UTILITY OF SILK WASTE.

The different transformations undergone by silk, up to this point, and those it has still to undergo until it arrives at the state of "stuff," occasions "waste."

This waste presents itself in different states. Those resulting from the operations which precede the torsion offer parcels of raw filaments

(*grège*) not twisted, known by the name of *frisons*, or waste from reeling cocoons.

There are *frisons* of different qualities, according to the period of preparation given to them, or according as they proceed from *cocons dégrainés* or *percés*. In this case the waste is more particularly designated by the name *golette*, from which are made coarse silks called *fantaisie*, *chappe*, &c.

The waste proceeding from the different manipulations, commencing with the winding off of the *grège*, in the throwing, and the operations of weaving, is generally composed of twisted ends, and is known by the name of *bourre*.

These two sorts of *débris* have been long utilized. They are divided, cleansed, ungummed, and then equalized by cutting to prepare them for twisting, as we have already said. But there is another kind of waste, long neglected, and which has commenced to be utilized only since the very high price of silk, namely, the *chiffons*, or rags of this material. Establishments of this kind are very rare; one exists in England, one in France, and a third in the United States. We have no knowledge of any other.

As to the winding of waste, we must limit ourselves to pointing out a certain progress, of which threads of this kind have been the subject as well in France as in Switzerland.

NEW THREADS OF SILK BOURRE.

We have seen, in the show cases of the Exhibition of these two countries, threads from *bourre*, (a sort of shoddy,) which rival in the beauty of their appearance the most lustrous silks, and at one-half the price.

These results are obtained by attention to details in the manufacture. All these operations have attained remarkable precision, and have been executed conformably to the indications of science, and by the application of certain preparations under special conditions. When the threads have been produced with the greatest care from waste, well purified, well combed, perfectly prepared and spun, the workman then proceeds to apply a thin layer or coating of warm gelatine or isinglass to the thread when stretched and in motion.

The drying and ulterior *chevillage* completes the work, and imparts to the products that peculiar brilliancy so much esteemed, and that elasticity so indispensable to manufactures of this kind.

The unusual care and attention brought to the working up of waste have been necessitated, as we have said, by the rise in the price of this material. It is not many years since the waste, which at present sells at from 12 to 15 francs, was worth only four or five francs, the kilogram.

This fact alone is sufficient to justify the efforts made to utilize waste of every description.

Formerly certain sweepings of threads were thrown on the waste heap

which the workmen knew not how to unravel; but for the disintegration of these the most ingenious and effective machines have been devised.

These machines take the rag or piece of silk at its entrance, restore it at its exit in the form of filaments, carefully classed in lengths and fineness, proper to be submitted to the machines for decomposing the *chiffon* or rag.

The inventors have not exhibited these machines, from fear of imitation by countries where inventions are not protected by patents. Prussia and Switzerland are in this condition, and they are precisely the countries which would derive the greatest advantage from their use.

DYEING AND SURCHARGE OF THREADS.

We have but little to say on the dyeing of silk, so brilliant in itself, and advanced to such an extraordinary degree of perfection.

No kind of material offers more splendor in this respect.

The invention of those colors derived from coal has principally contributed to or caused this revolution in the art of dyeing. The new materials have permitted dyers to obtain colors of unprecedented splendor, combining shades of marvellous variety with extreme delicacy. Looking through the Exhibition we might almost say, in the presence of the results obtained in this direction, there is now nothing impossible. Still, close by the side of products so admirable in respect to dyeing, we saw, on the contrary, much still left to be accomplished. We refer to the attempts made for some time to gild and silver threads of silk. Some specimens of silk of this kind exhibited denote processes still in a crude state, which do not yet supply any product capable of being used advantageously.

Another branch of dyeing is, on the contrary, in a very advanced state; sometimes too advanced.

Reference is here made to the means used to *surcharge* silks, so as to make them gain, if one wished it, as much as one hundred per cent. upon their normal weight.

This process has an honest origin, and sometimes its applications are honest; but it is not unfrequently used for purposes of gross deception. For example, when the threads and tissues are sold by length or by surface, these surcharges have no other result than to give a certain appearance to the article, while the thickness of the tissue plays no other part here than that which frequently results from the stiffness of stuffs of this sort, without any detriment to the buyer. But, on the other hand, when the threads and even the tissues are sold by weight, it makes the purchaser pay the price of silk for a considerable quantity of foreign matter which, sometimes, has not a fortieth part of the value of silk.

Nevertheless the authors of these operations, whose main object is to give increased weight to silk, are tolerated and even rewarded at the Exhibition, under the pretext that they thereby aid in meeting foreign competition.

These are specious pretexts which ought to be made known. As these efforts for facilitating the best employment of waste are worthy to be pointed out and recommended, so, on the contrary, these reprehensible practices are to be deplored and condemned.

WEAVING.

THE WEAVING OF STUFFS OF ONE COLOR, VELVETY, OR PILED FABRICS.

We observed at the Exhibition some plain silks made in France, Switzerland, and northern Germany, leaving nothing in this department to desire.

This result proves, that if the automatic working of plain silk goods be not yet general, it results from special causes in the organization of the fabrics, rather than from difficulties in the execution of the work, for the perfect specimens hereinbefore mentioned were exhibited with the special notice that the weaving was done by motive power.

We examined with care the looms by which this result has been attained. Looms of this kind were exhibited in the English, French, and Swiss sections of the Exposition. The two latter nations have more especially applied themselves to the construction of looms intended for silk weaving, while the English looms, being adapted to more general use in the weaving of almost every kind of fabrics, are not so well fitted to the weaving of silk, which demands particular care and special adaptation.

The Swiss and French also make the *canettes* for the tram, the *ourdissoirs*, destined to dispose the *chaine*, and the arrangements for raising and advancing it on the loom.

They thus have an appearance peculiarly their own. Competent men quickly observe that certain alterations, which influence only the proportions and relations between the different means generally used in all looms of this kind, and, in this case, important modifications.

These changes are especially employed in utilizing the peculiar elasticity of silk, so as to obtain from it the regularity which the interlacing of threads in silk goods demands, and also to be better able to secure cleanness, purity, and brilliancy.

By the side of the machines and apparatus of which we have just spoken was exhibited a French machine, to polish automatically these same stuffs. This machine, alike ingenious and efficacious, possesses all the advantages of hand polishing, acting with only a little polish and in parts.

All these machines have great value and interest for American industry; and it is the same with the automatic looms for the manufacture of velvet stuffs, such as plush for hats, &c.

These automatic looms may be arranged in two classes. The one class works two pieces at one time; the other only one. Both have their special object and employment.

The loom which makes two pieces at the same time is furnished with three chains superposed, the one above the other, at suitable distances. The middle chain is intended to supply the thread which, by the *coupé* or cutting, forms the velvet surface. The middle chain, or *chaine de poil*, has a much greater length than that of the other two. It is proportional to the length of the piece multiplied by the height of the *duvet*, and by the number of *boucles* or loops necessary to each of them.

The interlacings in the weaving of these three *chaines* are such that they form two *toiles* or fabrics, between which is interlaced a certain height of the thread of the *chaine*. This height is exactly and automatically separated in two by the middle one, in order to supply the velvet surface to each piece, which, thus separated, is then rolled upon a roller as fast as the section is worked.

Various articles in silk, and especially the most beautiful plushes for hats, are executed in this manner.

This system is more particularly suited to plain articles wherein the *duvet*, without the intervention of the *baguettes* or small rings employed in hand-weaving, necessitates a certain height, and can be employed to manufacture *façonnées* or figured stuffs and very smooth velvets.

The automatic work in smooth and fine velvets has yet only reached the extent of weaving one piece at a time. The operation is effected by the insertion of irons to determine the *boucles* or loops which remain closed in the work of velvet *frisé*. The iron is withdrawn when a certain number of *boucles* or loops are fixed by interlacements.

If, on the contrary, the object is to make velvet *coupé*, it is effected by cutting at the top each of these loops or *boucles*.

Thus, to the ordinary functions of weaving machines, it is necessary in the weaving of velvets to add combinations, which place and withdraw *baguettes* to form the *frisure* in which these *baguettes* are placed, and act as a knife or plane to cut these same loops in order to produce cut velvet.

These problems have been solved in the most successful manner by the looms at the Exposition. It need hardly be suggested that a personal examination of the machines above mentioned would give a far clearer idea of their structure and mode of operation than could the most elaborate description. The same may be said of the machines hereinafter noticed.

If from plain articles we pass to striped and plaid silks, in the execution of which Scotch industry has long excelled, we shall encounter some difficulty and embarrassment in choosing from among the numerous automatic looms now multiplied to a marvellous extent, permitting the frame to change spontaneously a greater or less number of trams of different colors. The numerous looms of this kind exhibited demonstrate the activity and necessity of research in this direction, and also the energy with which science and skill are employed on all those problems whose solution can lead to utility and economy.

It is not only in articles of an ordinary character that this tendency is observable. It is no less remarkable in silks of the richest devices, and especially in the most beautiful articles of Lyons adapted as well for dresses as for furniture.

THE WEAVING OF FAÇONNÉS.

It is worthy of note that despite the increasing dearness of silk thread these silks, so very rich in all the perfection of their manufacture, are not sensibly increased in price.

Never perhaps have the stuffs of Lyons displayed more taste than now. Never have they or those of Tours exhibited greater beauty and perfection.

Among the silks for toilette we remark, especially in the *façonnés* or figured goods, a fineness and neatness that seemed almost impossible till now, which denote a superiority to which French industry alone has yet arrived.

There are also combination *armures* and *moirés* as the basis of tissues, demonstrating that there no longer exist difficulties in this direction.

It was sufficient to traverse the gallery of the French machines to be fully impressed with these views. Ingenuity has been tasked in a thousand different ways to simplify the elements of the Jacquard loom and render it capable of producing still more extensive results.

It secures economy in the use of the cards, necessitated by this manufacture, by diminishing the surface of holes, or *trous*, and of the folds which separate them, in such a manner as to make them contain more in a given surface.

Besides the cards entirely dispensed with and replaced by a simple sheet of paper, further on, there is an ingenious combination which premits the same card to serve twice successively and to produce two different effects, and enables it also to economize at least 50 per cent. of cards.

There are savings of another kind in the automatic execution of stitching, due to the introduction of an additional organ into the frame to make *façonnés le battant brocheur*.

Blonde, an article in silk imitating lace, is also exhibited by both England and France. This article, made automatically, and which for years has displayed the most elegant designs, now presents devices the most capricious and seducing. These results are attained by the combination of the net lace frame with the principle of the Jacquard frame, skilfully modified in its applications.

Until now, manufacturers were content to vary the designs and multiply the figures, and hence a single loom of this kind produced with considerable economy hundreds of *bandes* at once. But that was not sufficient. The industry of Calais (the centre of the *tulle* and *blonde* trade of France) had just created an article essentially different from ordinary lace and *blonde*. It was obtained by the interlacement of threads acting exclusively in the direction of the *chaine* in the *tissues à maille*, to which we have alluded.

A transversal thread of the tram made a part of the tissne, the physiognomy of which and the mode of interlacing being thus essentially modified. The modifications, proceeding from an additional cross-thread, could be carried upon the *réseaux* from the bottom, and those of the *façonnée* at the same time.

A new and vast field thus opens to the specialty of reticular tissues, already so rich in fancy articles. Perhaps also this kind of stuff will pass from silk to cotton, and to other substances, and ultimately give results analogous to those of a species of gauze, which is produced, if not with great difficulty, at least with great slowness, and at considerable cost.

The new article may probably serve as tissues for sifting flour and all kinds of plaster substances.

The mechanical means by which these results are attained, and many others into the details of which we cannot now enter, combining with the use in a greater and constantly increasing extent of cheap silks, demonstrate a gratifying progress in this direction.

SILK RIBBONS.

We have only spoken briefly of ribbons from a technical point of view, because this industry was represented at the Exposition by but one loom, that for velvet, sent by M. Joyot, jr..

As to the products, they were exhibited for the most part collectively by the manufacturers of Saint Etienne, Basle, Prussia, Alsace, and other sections.

Saint Etienne contains 90,000 inhabitants, and with its suburbs gives employment to 23,622 persons, of which the greater part are women and girls. It has 15,000 looms. According to the Chamber of Commerce, the value of its productions for the year 1866 was 60,000,000 francs, ($12,000,000,) five-sixths of which was disposed of to the United States, England, and to the city of Paris.

The canton of Basle, with a population of 65,000 inhabitants, has about 6,000 looms for the manufacture of ribbons in the city of Basle alone. The manufacturers, many of whom are of the first order, employ from 300 to 400 hands each, while some few employ a much larger number. The United States takes the largest quantity of these goods. Then comes England, whose trade in continental silks has greatly augmented since the last treaty of commerce with France. It was at Guebwiller, in Alsace, that steam was first employed in the manufacture of ribbons. One may see there a mode ribbon factory which employs 600 persons, and contains 200 looms driven by a steam engine of 30-horse power.

DEPENDENCE OF SILK MANUFACTURERS UPON THE EAST.

In view of the vast capital invested in silk industry, and especially in silk manufactures, by leading European nations, and the great number of their people employed in its prosecution, we may, in the presence of

the crisis which has overtaken their silk husbandmen on account of the prevailing malady, pertinently ask what would have been the fate of the industry and the condition of its employés had not the extreme east been able to supply them with raw material in quantities sufficient to meet the exigency? And what advantages have not the nations of Asia derived from being thus brought into closer relations with the more elevated and advanced nations of western Europe? Notwithstanding the relatively low price at which they can supply their silks, they could not, a quarter of a century since, have anticipated so high a price as they are now receiving. Nor is this the only advantage resulting to these oriental nations from this species of traffic with the silk manufacturers of Europe. It will teach them how to bring their products to greater perfection at home, and will stimulate them to prepare them with such care, and bestow upon them such an amount of skilled labor, as to draw from them all the value and profit that comports with the excellence of their nature.

RÉSUMÉ AND CONCLUSION.

The manufacture of silk as already analyzed, and as it exists in countries the most advanced in the art, embraces seven special branches of industry, viz:

1. The rearing of the silk-worms.
2. The filature or reeling of the silk from the cocoons.
3. The throwing or spinning of the silk thread.
4. The dyeing of the silk.
5. The preparation of the silk threads for the looms.
6. The weaving of silk goods.
7. The spinning of waste silk.

These specialties, although consequent and dependent each upon the others like links in a chain, can nevertheless be practiced separately, as is the case now in some countries.

We have demonstrated that some of these employments present more difficulties than others to countries which, like the United States, have not yet had sufficient experience therein. America can, however, hope henceforth to excel in these industries whenever she resolutely wills it, and devotes to them that energy and skill which have placed her in the first rank among nations for certain of her inventions and manufactures. Let her not be disheartened at her efforts in this branch of industry, already most praiseworthy, and especially so in New Jersey, Connecticut, New York and Massachusetts, Pennsylvania and California; but let her press on and bring to this new enterprise that genius of investigation and energy in execution which have attracted to her so much attention, and attained for her such honorable distinction in the Universal Exhibition of 1867.

Concerning the seven industrial branches employed in the transformations of silk, four can from this period develop themselves without any

difficulty, and soon take, in America, the high position already attained by cotton industry, namely:

1. The throwing of the silk, consisting in the employment of apparatus more simple and also less difficult to direct than the greater part of the machines in the factories of the United States. As to the raw material, it is as easy for the United States as for England to immediately supply herself with raw silk in China, Japan, and even in the Levant and India. It is by no means improbable that at no distant day New York will become as important a depot of Asiatic silks as London now is. This may be accomplished *via* San Francisco through the medium of the Pacific railway. The raw material having thus reached New York, will be distributed not only among our own manufacturers, but portions doubtless will be exported to foreign countries. Let the New World take England as an example in silk industry. In less than half a century the silk manufacture of Great Britain (which does not produce a single pound of silk upon her own soil) has arrived at such a degree of development as to give employment to a large amount of capital and to about 110,000 looms, and direct occupation to some 200,000 persons, not including those engaged in the ribbon and silk hosiery manufacture.

2. The dyeing of silk, already an established branch of American industry, needs only the encouragement to be derived from the establishment of co-operative branches to compete successfully with European skill.

The preparatory processes of ungumming, cleansing, and scouring, are very simple operations, and can be entered upon without delay.

3. As to the regeneration and spinning of silky waste of all kinds, the United States find themselves in as good a position as most other countries to undertake a work of this sort, inasmuch as they possess equal facilities for procuring the waste and raw silk.

Who can doubt, therefore, that this will soon become an important branch of American industry?

In the manufacture of *passementerie* or trimmings, made to a great extent of silk waste, there are employed in Paris alone 8,500 persons, producing annually products to the value of about $8,000,000.

This branch of industry throughout France occupies more than 30,000 hands, and the entire annual production exceeds $20,000,000. It is one of the occupations which, like the manufacture of ribbons and laces, employs the largest number of women and children, who earn from 20 to 60 cents per day.

The wages depend both upon the skill of the laborer and the nature of the work. Men earn from 60 cents to $1 50 per day.

St. Etienne is noted for its fashionable dress trimmings; St. Chamond for its excellent cords, braids, and stay-laces, employing about 2,000 frames, or *métiers à la poupée*, in weaving stay-laces alone.

Most of these articles are extensively copied by foreign manufacturers

from samples obtained in Paris. A system has been inaugurated there for promptly supplying samples of all novelties in silk fabrics by the payment of a yearly subscription.

4. With regard to the automatic weaving of plain stuffs, the United States already compete successfully with the more experienced nations of Europe. It is gratifying to know that the looms exhibited by American constructors have been highly appreciated for their ingenious contrivances and remarkable improvements.[1]

There remain, then, three specialties, to excel in which time will be necessary to obtain the experience requisite for complete success. This our countrymen will indubitably acquire in due season, if they will only bring to the task their usual sagacity and proverbial perseverance.

These specialties are:

1. The rearing of silk-worms.
2. The reeling of the cocoons into raw silk.
3. The weaving of figured goods more or less rich.

We will speak of them in their order:

First. As to rearing of the silk-worm. The most important element in this matter seems to be solved, namely: the culture of the mulberry. The various previous trials in the United States already mentioned have proved that large sections of the country are admirably suited to the growth of this tree, so indispensable to the rearing of the worm. And from what has already been shown it may be inferred that if the breeding of silk-worms has not been hitherto entirely successful, it is probably because that, at the periods of these early attempts, the agricultural population was not sufficiently instructed in details, and therefore failed in some essential particulars, or lacked somewhat of that patience which the French and Italian cultivators bring to this particular pursuit. But with an increase of experience, daily augmented by recruits to our population from the skilled labor of Europe and China, with individualities and talents the most diverse and elastic, with abundance of capital seeking investment, and above all, with our fertile and remunerative soils, and the superior climatic conditions of large sections of our country, it is not possible that new trials, judiciously conducted, should fail of success.[2]

[1] The looms exhibited by Mr. M. Opper, of New York, Mr. George Crompton, of Worcester, Massachusetts, and the knitting machine of Mr. J. W. Lamb, of Rochester, attracted special attention, and a silver medal was awarded for each.

[2] As a proof how the introduction of this industry into a locality will enhance the prosperity of a whole people, an interesting fact may be cited from a recent French publication. An officer in the French army, having seen during an Italian campaign to what degree the cultivation of the mulberry tree and its attendant silk husbandry were enriching the population, resolved to introduce it into the little vale in the commune of Valleraugue, where he owned an estate. Soon after the introduction there was obtained there only some 2,000 kilograms, of very poor unsalable cocoons. But, after a few years, 200,000 kilograms, of an excellent quality, were produced annually, valued at 1,000,000 of francs, (say $200,000,) which sum was mostly diffused among the rural laboring population of a village of 4,000 inhabitants. The work was carried on in the following manner: the well-to-do proprietors

Second. The reeling or filature of the cocoons into raw silk, which comes next in order, constitutes, perhaps, one of the processes the most difficult to teach, and especially in localities wanting in experience in this particular branch of silk industry.

The superiority of the French and Italian silks over Asiatic silks is generally owing to the perfection of reeling. The success of this process depends, in a large measure, upon the care and watchfulness of the attendant, especially so far as the perfection of the product is concerned.

The rapid analysis above made of this kind of labor may assist us to understand the difficulty that besets this branch of the work; but we shall render it still more palpable by saying that the most experienced workwomen can hardly produce more than 300 grams (or 12 ounces) in good silk of the ordinary qualities obtained from five or six cocoons per thread, of which the quality or fineness is from 10 to 12 *denier*, being 24,000 yards per ounce.

Nevertheless, the country which produces the most skilful and careful spinners of wool and cotton manufactures will not despair of arriving eventually at the successful production of the many kinds of silk goods so clearly within its province.

Third. Though we feel assured that the industry of the United States will soon largely develop itself in the weaving of plain, striped, and plaid silks, of velvets, of plain ribbons, and other silk fabrics, simple in their character, yet we cannot conceal the fact that long and patient study is necessary to produce articles of sufficient novelty and artistic skill to compete with European industry, and more particularly with that of Lyons, which shines with a brilliancy peculiarly its own.

The great experience, cultivated taste, and extensive knowledge of the French, have made this specialty with them a veritable art.

The employment of Jacquard looms forms the basis of success in textile fabrics. But although this loom is universally in use, the effects it can produce have been nowhere pushed to so great an extent as in France, and particularly in Lyons.

The same may be said of Calais in its application of the Jacquard to *blondes*, or figured silk laces.

The Exposition proves, by products of this kind, that henceforth to automatic labor almost nothing is impossible.

The magnificent specimens of lace there displayed, which imitate and well nigh rival the most exquisite and elaborate efforts obtained by the slow and tedious process of hand labor, are now the results of the motive power of steam, while the functions of the workmen are limited to a superintendence which becomes almost a sinecure on account of the admirable precision and perfect execution of these machines.

gave out the silk-worm eggs to the laborers, upon the condition that a quintal (100 pounds) of cocoons be returned for every ounce of eggs; also, giving them a sufficient quantity of mulberry leaves to feed the worms hatched from the eggs, and a certain quantity more. The cocoons produced from the surplus constituted the profit of the silk-worm cultivators.

It is thus that fabrics, alike beautiful and useful, once ranked among articles of luxury, and accessible only to the wealthy, are each day rendered more available to the masses, contributing both to the prosperity of the producer and the gratification of the consumer. So far from despairing of ultimate success in rivalling the most elaborate and brilliant productions of Europe in this department of industry, the people of the United States may take courage from the fact that already a most successful beginning has been made in silk weaving.

Paterson, New Jersey, and Hartford, Manchester, and Mansfield, Connecticut, are already noted for their extensive silk manufactures.

For many years past all the sewing silk and twist used in the United States have been of home manufacture.[1] The same is, in a measure, true of pongee handkerchiefs. Rapid progress is being made in the weaving of ribbons, braids, trimmings, fringes, and various kinds of dress goods.

More especially may Americans be encouraged to prosecute this industry in view of the exemption of our continent from the malady among silk-worms now prevailing in Europe.

The devastation carried by the epidemic can hardly be overestimated. The steady advance of the malady threatens to embrace within its widening circles the silk-growing countries of the east, and thus cut off one of the main sources whence European manufacturers draw their supplies of raw material.

The calamity has thrown a pall over silk industry in all its branches. In the course of a speech on agriculture, delivered last year in the Corps Legislatif, M. Thiers said that the annual loss to silk culture in France from this cause alone, for several years, has been upwards of 100,000,000 of francs, ($20,000,000.)

Andrew Murray, esq., in an elaborate report on "Products of Useful Insects" at the Paris Exhibition, printed in the Illustrated London News of the 6th of July last, in speaking of the supply of *graines* (eggs) in the future, says:

"While things jog on as before from year to year, the cultivator will be slow to believe it possible that a time may come when no fresh *graines* (or eggs) are to be had. But the supply hangs upon a thread; when every silk country in the world shall have become infected, then the supply must cease. And we are not far from that stage. Japan and Australia are the only countries now free. When they go, the silk trade will collapse, and silk be blotted from the list of textile fabrics. That indeed would be a calamity which would come home to ourselves. Our silk spinners and silk weavers, our ribbon makers, our silk mercers, and the thousands who depend on these trades for subsistence, would have their occupation gone, and ruin and starvation would await a large portion of our population. Surely, to avert such a result, not only in this

[1] The Williams Silk Manufacturing Company, of New York, exhibited excellent "silk twist," for sewing machines, for which *honorable mention* was made, equivalent to a diploma.

country, (Great Britain,) but also over a large part of the continent, deserves that every suggestion which promises escape should be carefully considered; and surely, if by any measure, however stringent, one country could be cleansed from the infection before its spread ends in a complete extinction of the race, and so the threatened ruin averted, it ought to be adopted."

Unlike almost all epidemics, this does not disappear from a locality after one or two visitations, but once established, it remains, while its virulence increases rather than diminishes. This extraordinary trait is attributed to the fact that the silk-worm, by the law of its existence, is an annual, and therefore has no acclimated subjects, but presents to the epidemic a yearly supply of fresh victims. And in view of the geographical position of the United States, it may be noted, that M. de Quatrefages, an eminent French writer, who has carefully studied this subject, expresses the opinion that, contrary to the general course of epidemics, this travels eastward rather than westward.

This mysterious malady, which seems destined to destroy silk husbandry in the whole eastern hemisphere, has not appeared in the western. In view of its easterly course, and with the Pacific ocean between it and the American continent, and with our superior climatic conditions, it is hoped and believed that with precaution and care it will never reach our shores.

The soils, and especially the climate of those States of the Union where the cotton plant and the sugar cane have been wont to flourish, are peculiarly adapted to the raising of the mulberry and the raising of silk-worms.

From obvious causes some of the long existing industries of portions of these States will hereafter be necessarily modified to a noticeable extent. The culture of cotton and the production of sugar will not so exclusively engross the attention of their population as formerly. A portion of their capital and labor will doubtless seek new fields for the exercise of their energies.

Are not these facts an exhortation, an admonition even, to the people of the United States, to promptly avail themselves of their providential advantages, and by devoting a liberal share of their resources to the production and manufacture of silk, save this important and beautiful industry from ruin, while at the same time they advance the prosperity of their own country and confer incalculable blessings upon the world?

In conclusion, the undersigned cannot refrain from expressing here publicly his thanks to Messieurs Arles-Dufour and Duseigneur, of Lyons, and M. Alcan, of Paris, as well as to the many prominent manufacturers and merchants in the different centres of industry in Europe whom he has visited, for their kindness in assisting to make the numerous resaarches which became necessary in the examination of this important and diversified subject.

The works of M. Louis Reyband, M. Pasteur, M. de Quatrefages, the archives of the chambers of commerce of the various cities of France,

Switzerland, and Germany, and especially that of Lyons, have been valuable sources of information.

The report now submitted has swelled far beyond the limits anticipated at its commencement; but, silk industry in all its branches, now grown to such importance throughout Europe, the conspicuous place it occupied in the Exposition; its comparative novelty in the United States, and the prospect that ere long it will be firmly established and diligently prosecuted in many sections of our country, seemed to call for a careful and thorough investigation, and a full and detailed statement of facts and conclusions.

I have the honor to be, sir, very respectfully, your obedient servant,

ELLIOT C. COWDIN.

Hon. WILLIAM H. SEWARD,

Secretary of State, Washington, D. C.

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PARIS UNIVERSAL EXPOSITION, 1867.
REPORTS OF THE UNITED STATES COMMISSIONERS.

REPORT

ON

CLOTHING AND WOVEN FABRICS,

BEING

CLASSES TWENTY-SEVEN TO THIRTY-NINE

OF

GROUP FOUR.

BY

PARAN STEVENS,
UNITED STATES COMMISSIONER.

WASHINGTON:
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1870.

INTRODUCTION.

The United States Commissioners to the Paris Exposition of 1867 appointed a committee consisting of Professor J. Lawrence Smith, Doctor W. E. Johnston, and myself, to report on the Products of Chemistry, on the Preparation of Food, and upon Clothing.

It was not found convenient to pursue this labor jointly, and the report on chemicals was undertaken by Commissioner Smith, the report on food by Commissioner Johnston, and that upon clothing was left to the undersigned.

Without any special qualifications for this work derived from my habitual pursuits, or any opportunity for preparation, I occupied myself with the collection of materials and memoranda for the report. Among the more important of these materials I mention the valuable reports in French upon some of the classes by members of the International Jury, from which translations have been freely made. With these reports, and with the excellent assistance I was able to procure, I have completed the task which fell to me, and now submit the result to the Department with the hope that it may be found of some practical interest and value.

PARAN STEVENS,
United States Commissioner.

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STATISTICAL TABLES.

CLOTHING.

CHAPTER I.

CHANGES IN THE FASHION OF CLOTHING—COSTUMES.

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In the classification adopted by the Imperial Commission, "Clothing, including fabrics and other objects worn on the person," were assigned to Group IV, Classes 27 to 39.

It was obviously impossible to enter upon an exhaustive discussion of the wide range of subjects which were here grouped together. It was one of the most comprehensive groups in the whole Exposition, including not only made-up clothing for both sexes, but cotton, linen, woolen and silken fabrics; hats, bonnets, gloves, umbrellas, articles used in traveling, laces, and ornaments of all kinds. Special reports upon cotton, wool and silk, as raw materials, and partly upon the manufactures of each, having been made by others, the present report is confined more exclusively to clothing, and those objects which are accessory either for comfort or ornament, and the effort has been made to present some statistical data of general interest and application. The number of exhibitors in these classes was considerably over one thousand. France had two hundred and nineteen, Great Britain forty-two, and the United States nine.

HISTORY OF CLOTHING.

The history of clothing, it may be said, is coeval and intimately associated with the social and political history of man; and when the task of setting forth intelligibly the subject of clothing, as one of the great prime necessities of the human family, and in its economic relations to other industries represented at the Universal Exposition, is entered upon, it will be proper that some historical outline of the changes which

have occurred in the attire of both sexes should at the same time be placed before the reader. In fact, as it was intended that the Exposition should be universal, not only showing the present stage of advancement in all useful productions of human industry or skill and the modes of production throughout the world, but all of the various preceding stages of progress, the articles, the manner of using, and the processes of fabrication, to omit such a retrospect as that referred to would be ignoring the spirit in which this comprehensive epitome of the productive energies, inventive resources, and progress of the world was conceived.

In the early ages of the world dress was simple as the manners of the people who inhabited it, being at first composed of leaves, feathers, and the skins of animals. Gradually the inventions of tanning, spinning, weaving and dyeing were adopted, and mankind yielded to the temptations of vanity. They abandoned the simple modes of their forefathers and gave themselves up to the most luxurious and costly adornment of their persons.

To such a height did this devotion to dress and finery attain, that decrees and ordinances have from time to time been adopted by many nations to lessen the growing evil. So great has been the passion for dress in some periods, that revolutions have resulted from the attempted enforcement of sumptuary laws and edicts intended for the prevention of extravagance.

When the Tartar conquerors of China ordered that the luxuriant tresses of the native inhabitants should be cut off, the victims regarded it as such an indignity that in many instances the native Chinese preferred losing their heads to submitting to the decree.

In Spain, also, violent disturbances were caused in the last century by an attempt to prohibit the use of the capa and sombrero.

In England many efforts have, at times, been made by the governing powers to check not only extravagance in dress, so far as richness and splendor of materials were concerned, but also to change the cut and style of various parts of the apparel of both sexes. Several of the earlier monarchs attempted to restrict the length of pointed shoes, and though fashion yielded to the sustained attacks, she revenged herself by the introduction of shoes of such extravagant width that another restraint was soon imposed by the royal authority.

Queen Elizabeth made many laws affecting the attire of her subjects, though she was proverbial for her fondness of dress and the singularity of the fashions she preferred. She compelled the peasantry to wear a cap of a certain shape, and, probably to encourage home industry, as well as to restrain the mania for foreign fashions which had long been prevalent among her subjects, she ordered that this head-dress should be of domestic wool and manufacture. She also limited the size of ruffs and swords to be worn by her courtiers to the proportions she regarded becoming in subjects to adopt, and appointed officers to watch for vio-

lations of the law, and to break all swords and clip all ruffles exceeding the prescribed limit. She also entered with much detail into the regulation of the costume worn at the inns of court, specifying forms, colors, and the quantity of embroidery to be used.

The Turks have also in times past set their faces against the use, on the part of Grecian ladies, of long skirts peculiar to their traditional and classic mode, and officers have been appointed to cut off any superfluous length. The Turks have established many other regulations concerning distinctive dress, such as a monopoly to themselves of yellow slippers, rich silk or muslin turbans, and shawls of the gayest designs and textures, while they required their Grecian vassals to wear dark cotton caps, the Armenians to adopt grotesque pumpkin-shaped capas, while brimless caps, shaped like inverted flower-pots, were prescribed for the Jews.

Of late years, however, the Turks themselves have yielded reluctant obedience to a decree of Sultan Mahmoud, ordering that a red cloth fez or military cap should be worn by Mussulmans in place of the calpac or turban. This ordinance was violently opposed and protested against, and those who favored it had their houses fired; and though the will of the Sultan prevailed, the Turks have never recovered from their disgust at the supplanting of the cherished turban so long worn by their ancestry.

Charles the Second, of England, prescribed a particular costume for the nobility to wear, dispensing with extravagant display of gold, silver, lace, and jewels, which had distinguished the preceding period of his reign.

Gustavus, one of the kings of Sweden, prescribed a court dress for each sex, to be worn when they were admitted to his presence.

Napoleon the First, against much opposition and criticism, exercised his imperial authority in the same direction; and in times of great political agitation, his proceedings on the subject were discussed with much vehemence and interest in the national convention of France.

It is difficult to realize that France, the dispenser of modes and of the most elaborate and beautiful materials and articles of dress, was in her infancy as primitive and rude as any of the other countries of Europe in matters of costume and toilet. Skins fashioned into a form which might be described as a tunic, with the addition in winter of a cloak which fastened over one shoulder, descended nearly to the ground, and a skin cap of very simple form, constituted the dress of the men. The women wore almost the same attire, only the tunic was longer, and the cap triangular in shape. But even in that primitive period, tradition says, they exhibited a marked predilection for such personal decorations as necklaces, bracelets, rings, and chains. Ancient statuary has been exhumed in that country, in which the figures were dressed in tunics with long sleeves reaching to the hand, the over dress being similar to the Roman *sagum*, with the addition of sleeves. On the heads of the figures were caps resembling the Phrygian bonnet.

Some variety is exhibited in the minor details of their dress. For a long period the higher classes wore long robes trimmed with ermine or other valuable furs. The early kings of France, beginning with Clovis, wore a tunic and a mantle resembling the Grecian *chlamy*.

Changes are first to be noticed in the garments which are represented in two statues of Charlemagne. The first gives a moustache, but is without any indication of a beard, a tunic terminating above the knees, and a *chlamy* with a wide border; fillets bound crosswise cover the legs. The costume of the other figure consists of a garment similar to a modern surtout. It has large broad sleeves with deep cuffs turned back, and a square collar. It is quite remarkable that this dress is ornamented with large round buttons, an article generally supposed to have been unknown at so early a period.

In the manuscript illuminations of the reign of St. Louis, the princes are portrayed in variously shaped habits. This leads to the belief that fashion was then taking her place as an institution which was to exert a powerful and lasting influence upon mankind.

Prince John wears hanging sleeves over the close ones of his tunic, and he holds in his hand a glove. Another of the princes has upon his head a cap, and wears a garment like a surtout, which shows the vest underneath. Another sports a hat like some of modern form.

About the middle of the fourteenth century was a period of great extravagance in regard to everything pertaining to the toilette. Garments were made brilliant with gold and silver, and such was the demand for precious stones, that they became very scarce, and the price of them advanced materially. Embroidery usually adorned the *côté hardi*, the under-sleeves fitted very closely, while the upper ones were long and narrow. Feathers were now first worn on the caps of gentlemen. The ladies' bonnets assumed an almost endless variety of forms about this time, and for the first time since the introduction of variable fashions, the female head relied upon the hair, without cap, bonnet, or hood. A large curl or plait on either side of the face, and a small spray of flowers or jewels, constituted its only ornament. The trains of the gowns became very long, and they were held up by pages.

In England, during the reign of Edward the Third, many new devices were introduced, most of which were from foreign lands. The Monk of Glastonbury writes, that "the Englishmen haunted so much unto the folly of strangers, that every year they changed them in diverse shapes and disguisings of clothing, now long, now large, now wide, now strait, and every day clothingges new and destitute and divest from all honesty of old arraye or good usage; and another time to short clothes, and so strait-waisted with full sleeves, and tapetes of surcoats and hodes over-long and large, all so nagged and nib on every side, and all so shattered, and all so buttoned, that I with truth shall say, they seem more like to tormentors or devils in their clothing and also in their shoging [shoeing] and other array, than they seem to be like men."

In the reign of Richard the Second, great extravagance in dress prevailed, and most of the novelties of the toilette were drawn from France, Italy, Bohemia, Poland, Spain, and Germany.

During the reign of Elizabeth, pins, ribbons, and knit silk and worsted stockings were manufactured in London for the first time. At the death of Elizabeth, it is stated that there were three thousand suits in her wardrobe. The reigns of James and William and Mary were distinguished from that of their predecessor chiefly in the difference in coiffures. Enormous hoop-skirts came into wear at this time and remained a favorite article of dress until the nineteenth century, when George the Fourth condemned them as cumbersome and inelegant.

From the early part of the nineteenth century, the fashions originating in France have generally been adopted with little or no change by the English, as well as by nearly all other civilized nations, and this seems likely to be the case so long as the French are able to command facilities superior to other nations in rapidity and excellence of designs, and to retain for a long time the lead in the manufacture of silks and many other delicate fabrics.

CAUSES OF CHANGES IN FASHIONS.

It is obvious that aside from love of ever-varying novelties on the part of the consumers, there must be the great commercial motive of gain, inspiring and impelling the producing classes to call for the acceptance of new changes with as short intervals as can be tolerated; and though among sensible people of moderate incomes the rule seems to have been adopted and followed of restricting purchases to such quantities as will last in good condition only until the usual season for the expected change, or such material as can be made by alteration to conform to the mode, there is a general tendency among the arbiters of fashion to make the transition as radical as possible, in order to force a more general demand for the new styles. One month we have coat skirts hanging near the heels, when suddenly the decree of fashion abridges them to such a degree that we seem like schoolboys in roundabouts. The same is true as to length of waists, fullness or scantiness in the legs of pantaloons, the forms of shoes or of hats; and so, also, in female attire, equally extreme and arbitrary changes occur.

It is natural that the very prosperous group of clothing industries should be subject to occasional periods of overgrowth, especially where they are centralized as in Paris, gathering into their service too large a force of artists, artisans, and operatives. It is natural, also, that all of these classes of producers should share in a desire to have as constant and profitable occupation as they can obtain. It is noticeable that since the general adoption of steam-power conveyance of travelers by land and sea, the facilities of intercommunication have vastly increased the currents of foreign travel; and thus has the spread of detailed intelligence been quickened and made more frequent, and designs of new modes and

descriptions, samples of new materials, emanating every month or two from the great centers of fashion, have been scattered like falling leaves in every land, and thus the danger of an overstocked labor market is lessened, and the hands trained to industry are kept supple and expert.

Matters of taste being among the highest worldly evidences of the degree of civilization of a nation, France is naturally ambitious to maintain the vantage-ground; and having got so far the advance in all the preparatory systems of study and training, it is probable that all efforts at competition with her in these specialties will prove futile, until the new young republic of the West, guided by the experience of the older nations, and having established systems of industrial and art education and training, combining the best features of all of their prototypes of the eastern continent, and having collected in her museums and schools reproductions of the art treasures of Europe, shall, in maturer age, develop, in connection with the material resources of silk, linen, cotton, and every useful fiber and fleece, the originality, invention, and enterprise which in other branches of endeavor have become national characteristics.

It is doubtless an experience common even to persons of taste and refinement, that the impression which the mind receives, whether of approval or disapproval, of some peculiar fashion, depends upon its origin, association, uniformity, and succession. A sudden transition, unheralded by the journals which lend sanction and authority to every mode, however inconsistent with all requirements of taste, or opposed to ideas of convenience or health, and if imitated by a lady unknown to what are considered leading fashionable circles, would only excite merriment on account of its singularity; while if the same change had originated among those upon whom the fashionable world had been accustomed to look as the legitimate inventors and dispensers of modes, and had been simultaneously ushered in and adopted by those who, being on the alert, and possessing wealth, are regarded as leaders of fashion, then, although some faint protests and incredulity may be at first expressed, the new style rapidly gains adherents, and suddenly the invasion is complete.

From this state of things arises the significance of the phrase in fashionable parlance of the "*air distingué*." All modes, however bizarre and absurd they may seem at first observation, having once passed through this ordeal, become, either suddenly or gradually, invested with the quality which that phrase is intended to describe. The gravity with which the fair wearers move about, involved in combinations and forms which distort or caricature nature's graceful proportions, unconscious, apparently, of any departure from her laws, leads us to the inquiry whether the implicit obedience yielded to the decrees of fashion, without appeal to reason and judgment, has not, even in modern times, been too much like an abject submission to a despotism which is not devoid of mischievous consequences; whether some code of principles cannot be established by which the canons of pure taste and the requirements of

symmetry in form and harmony of color shall be the first essentials of the *air distingué*, and that any behest of fashion which ignores these shall fall as a dead letter from the moment of its utterance.

Some of the whims of fashion have been so inopportune as even to affect injuriously the health of myriads of her followers, of both sexes.

A love of dress, if indulged by a cultivated intelligence without overtaxing the pecuniary resources of the individual, far from injuring or obscuring any mental qualities, may, by the constant appeal to the judgment and taste, especially in woman, tend to develope those qualities of the mind in the wearer, as well as in that of the producer, which exercise a refining influence upon character. In familiarizing the mind extensively with combinations the essentials of which are invention, grace, harmony of color and design, and elegance of material, texture, and workmanship, all of which are to enter into a harmonious combination with the most graceful and beautiful of objects, the female form, thus presenting an ensemble which shall fulfill the highest demands of taste, every kindred esthetic faculty is drawn into activity, and by the quickened and refined perceptions, what is discordant, bizarre, and grotesque in prevailing modes is eliminated and discarded.

PARIS THE GREAT CENTER OF MODERN FASHIONS.

The establishment of Paris as the central authority and oracle of fashion for the civilized world has been by no means the result of accident, nor has it been devoid of profound political significance and subtle design.

Owing to the superior means adopted for retaining the ascendency early acquired in matters of design and taste, France has thus far successfully maintained that position, and her experience has proved that even much abused fashion is not without its healthful influence on the substantial utilitarian progress of mankind. This is easily realized when we consider what are the studies essential for qualifying the artisan and laborer to originate and carry out designs fulfilling the requirements of critical taste in all the branches of production which supply to the world articles for the adornment as well as the comfort and health of the person, articles for domestic use in dwellings, combining utility with the beauty and grace which artistic genius or cultivation can impart, articles of vertu and of decorative art, produced chiefly as luxuries for the wealthy, and, finally, works involving a mastery of the highest principles of art, such as design, painting, and sculpture. These studies, pursued in the best organized methods, with access to the galleries of paintings and sculpture, and to the best examples of every art which appeals to the esthetic sense, inevitably carry the intelligent student into wider and wider fields of information, enlarging the operation of his mental organization, and expanding bis view far beyond the narrow limits of the special object of his pursuit.

The cumulative results of the application of a people to particular departments of productive industry, with the powerful co-operation of

science and art, is illustrated in the case of France, and she is confessedly the leading nation in the respects to which reference has just been made. She has elevated the standard of quality in those branches to which she has given her energies and her science, and has, by exemplifying the benefits of her system, excited a spirit of emulation among the leading nations which will greatly promote the progress of all.

But in another view the apparent frivolities and rapid mutations of fashion contribute something real and substantial to the well-being of society, if restrained within such reasonable limits that the benefits are not counterbalanced by the extravagance or wastefulness which too frequent changes involve: for they give constant employment to thousands of industrious hands, stimulate the inventive faculties and inspire the student and savant with new motives for penetrating more deeply into the mysteries of nature, and revealing latent properties and powers, which, when called into action, may surpass all preceding discoveries. A striking instance of this character may be mentioned here:

In the year 1856 one of the great chemical discoveries was made which from time to time have so signally vindicated the claims of science to the first rank as a guiding spirit to productive industry. It was the discovery of the aniline colors derived from coal tar, and generally classed under the heads of violets, reds, blues, greens, blacks, yellows, &c., and giving a variety of beautiful secondary combinations. Manufacturers of textile fabrics have thus been furnished with a series of colors of the most brilliant and varied hues.

From the very interesting and instructive report of Mr. John L. Hayes on wools, accompanying this series, I take the liberty of making the following extract, which sums up the merits of these discoveries in a most eloquent and appreciative manner:

"The use of these colors gives a marked character to the dyed tissues of the present age. The great change effected by them was remarkably illustrated at the Exposition by a display of parallel series of wools dyed by the ancient and the new aniline processes. The aniline hues were predominant in the richly colored fabrics of the Exposition, and, adopting the figure of Colbert, that 'color is the soul of tissues, without which the body could hardly exist,' we might say that these colors fix the psychological character of the fabrics of the present day. Among the wonders of modern science, what is stranger than this, that the gigantic plants buried in the coal measures of the ancient world are made to bloom with all the tints of the primeval flowers upon the tissues of modern industry?"

EXHIBITION OF COSTUMES.

SPECIMENS OF POPULAR COSTUMES.

Class 92 was devoted to specimens of popular costumes of different countries in methodical collections, showing the costumes of both sexes

of all ages and those most characteristic of each country. This plan was realized to a great extent, especially in the Russian, Swedish, and Norwegian sections, where, in promenading, the visitor was often startled by the life-like figures of peasants and of interior tribes. In the Chilian exhibition the costume of the miners of that country was shown in accurate detail, by the life-size figures standing by the side of the heaps of copper and silver ores sent from the mines of the Andes.

But perhaps the most striking feature of the occasion, disconnected with classifications of the Exposition, was the extensive display of costumes upon the persons of many of the visitors and some of the attendants at the various sections. Of the male delegation there were Orientals in bright colors and flowing draperies, and people from the Western countries in garments of more somber material and more formal cut. There were Greeks and barbarians of the European world, and natives of the Celestial Empire, and their more flowery Japanese neighbors; and here and there, as strangely picturesque as any, peasants in ante-revolutionary costume, still preserved, coming from remote side villages of Napoleon's home provinces.

Most noticeable on the female side were the waiting girls at the different national shops, restaurants, and beer-houses, sharp-eyed for business, and ornately decked in the highest style of their quaint local modes.

HISTORICAL AND FANCY COSTUMES.

A few choice specimens of historical and fancy costumes for both sexes were exhibited by Madame Delphine Baron, one of the eminent practitioners in the art of costuming, which is carried to so great perfection in Paris. Its successful practice in the higher grades requires no inconsiderable historical study, and calls in play really artistic qualities. Not unfrequently the dancer at a carnival ball carries on his back the work of a distinguished master.

The costumes in Don Juan d'Autriche, when that play was revived at the Theatre Français a few years ago, were said at the time to be composed or corrected by Meissonier; those for Ristori's Medea, when she first appeared in Paris, by Ary Scheffer; those of Sardori's Don Quixote, and of Offenbach's buffo opera Ste. Geneviève de Brabant, by Gustave Doré. The late excellent historian, Bouvière, himself a painter as well, in his Faust and Hamlet, followed in pose and apparel the masterly illustrations of Delacroix much more closely than the translators permitted him to follow the text of Göthe and Shakspeare.

POPULAR COSTUMES OF DIFFERENT COUNTRIES.

ABSTRACT OF A REVIEW OF CLASS 92.[1]

Costume is sometimes, in its material and form, directly regulated by climate, as in the hyperborean regions of Lapland, Siberia, and Finland,

[1] Translated and condensed from the report of M. Armand-Dumaresq in the Rapport du Jury International.

Alaska and Greenland, which are located far from the great commercial centers. A glance at the Ostiaks, Yakouts, and Aleutians will show that these peoples, dressed in reindeer or other skins, living among eternal snows, in grand solitudes, subsisting by hunting, having few wants, are satisfied with what we would hardly call the necessaries of life.

Though the varieties are very distinct, those which are peculiar to metropolitan centers are difficult to classify. The date of the origin of a costume is easy to ascertain from the form of a garment, but why the rustic of Batz has retained in the nineteenth century the dress of the time of Louis XIII, elsewhere regarded as a relic of antiquity, we cannot tell. It may, perhaps, be attributed to his particular calling. When the salt man entered a village his arrival was announced by the bells or rattles on his mules. Before his fanciful hat and elegant jacket were seen, the housekeepers ran out to get their supply of salt; thus that costume was preserved as a sign. But let us consider those consequences of these customs which are of most importance to us.

Manners, customs, and usages are still preserved, and they have a mysterious connection with costumes. A girl cannot often make up her mind to marry a man not of her village; gradually a distinct race forms, and the men remain at home, forming a self-governing colony. We find patriotism and love of home most developed in those countries where the rustic has preserved the costume of his ancestors, and this incessant and reciprocal supervision insures honesty and unity among the inhabitants. There is a touching harmony in the existence of those people that is sure to strike the eye of an observer.

Now let us state the distinction between costume and dress.

Costume is the same for all, for the man or boy, the woman or girl, and does not change. It is composed of solid and durable material, without regard to fitness; what was once a Sunday costume, soon becomes a working costume; hat, jacket, and pants are often repaired, but never undergo a change of form. That is what we call costume.

Dress belongs to cities. It changes with the whim of the fashion. Every part of it has a peculiar destination, that is, for show or for work. The laborer is not dressed if he is obliged to wear his week-day clothes on Sunday. He must have two suits at least. This expense is to make him look like his fellows, and to follow the fashion of the wealthy classes. Yet, what is fashion? Merely an invention for worldly people to know each other by. Ought sensible people who have something to do, to be compelled to follow the fashion? In France, as elsewhere, fashion is a tyrant that even city work-people consider themselves obliged to obey. Though expensive, they wish to get fashionable clothes as cheap as possible; no matter about the material, so long as the style is fashionable. In France the laboring man must have a new suit, no matter how poor the material; whereas in England he is satisfied with the cast-off fashionable clothing of the better classes. The gaudy garments of a fop in Hyde Park serve the dock laborer, and at last the unfortunate Irish resident of Saint Martin's Lane.

The rustic's choice of something strong, solid, and well made is the best. He wants the garment to be of good material, without regard to form, for it has to live on him for many years, till it becomes a part and parcel of himself. The old dress gives the history of the man.

If a comparison is made between the expenses of the rustic who pays dearly for his clothing, and the city laborer who seems to buy cheaper, the former will have the advantage in the durability of his material.

The morals of a people are favorably affected by a peculiar costume, and the artistic aspect of costume is evident to the least attentive observer. Wherever we find originality in men's or women's costumes, we like to represent it in pictures and albums, to be kept with care. The inhabitant of the country is more attached to his costume than the artist who studies it merely to find an attractive harmony of colors.

With six hundred costumes for exhibition, it is not surprising that there were so many ways of showing them. The lay-figure was, however, generally adopted with great success, as by Sweden and Norway. It consisted of an iron frame, stuffed with straw, so as to show all the curves of the figure, and vary the movements. The heads and hands, giving the type of the country and race, were moulded from nature in plaster; the heads were retouched and finished by an artist; the hands were nicely made to exhibit every indenture of the cuticle. This method was effective, but costly. If we look to the result alone, it was perfect.

The other lay-figures, such as are used in shops, were far inferior to the kind we have just mentioned, and the heads and hands were very imperfect. Pasteboard figures were used by the French commission, because of their cheapness, and they were generally rudely made in the department whence they came.

Ethnology, connected with the study of costume, is a science much cultivated in Europe. Russia has long had museums of costumes, and statuettes of the different people in the empire. Turkey has collected at Constantinople all the ancient costumes of that country; so has Sweden, Norway, and Hungary, in their respective centers. In many countries costumes are faithfully represented in statuettes made of colored clay, baked and dressed, as in Italy, Spain, Portugal, India, Malta, and America, where there are excellent specimens. There is no science more striking or easier learned; it is not a labor, but a diversion, a pleasure; hence the success of that part of the Exhibition. Crowds always filled the different halls of Class 92, and never failed to stop where the use of the articles was understood. The public felt that such an exhibition was a study where much could be learned, and the visitors sought instruction.

When costumes are preserved without modification in a country, classification is easy to make by cities or nationalities; but if the costume is becoming obsolete, and clothes no longer worn are brought to you, the classification becomes difficult; it is impossible to follow a single method; and this happened at the Exposition of 1867. In France,

particularly, it was necessary to collect costumes of the last century, still worn by very old men; rare, it is true, but still partially used. The classification adopted by the international jury was independent of these different systems; it was dictated by the importance of each lot; and such is the system followed in the succeeding review of the costumes on exhibition.

SWEDEN AND NORWAY.

The royal commissioners of Sweden and Norway furnished seventeen groups, of thirty-two figures, varying by groups. This lot was in the first class. All the principal Scandinavian costumes were there represented, and at the same time, the different ages, trades, and customs of the country, executed under the direction of Mr. Dardel, a distinguished artist and superintendent of the fine arts in Sweden, assisted by Mr. Soederman, a Swedish sculptor. The lot is artistic and natural in its composition; it forms a collection of *genre* pictures, representing "Harvest," "A girl dressing," "The rustic oracle," "The groom's visit," "Asking the mother," "The betrothed," "The Laplander in a sled drawn by a deer," "Two Lapland women and children," &c. The heads and hands, as has been already stated, are very true to nature. This lot may be considered as a model of its kind.

TURKEY.

The Ottoman government sent a very curious collection of popular costumes of different classes of society; the number was eighty; here are some of the most important: the Zerbek, from the province of Smyrna; the Arnaut, Bulgarian, Bosniak, Laz, province of Trebizond; Circassian of both sexes; a man and his wife of Mount Lebanon; Albanian, Kurd and his wife; a Jew of Jerusalem and one of Bethlehem; a man of Damascus and one of Salonica; a woman of Asia Minor; a weaver and a cook of Constantinople; a Turk citizen, laborer, and shepherd; a Bulgarian wife; a man of Djedda, another of Bagdad, and one from Mecca.

These costumes are very varied in form; many are covered with gold embroidery and gaudy braid of all colors. Cloth, velvet, muslin, gauze, fur, and morocco, are strangely mingled in their composition. Drawings would represent them better than any description. Their price is low, considering their richness and elegance. It is the Oriental taste in extreme sumptuousness.

GREECE.

Greece has furnished rich costumes, so covered with gold that the cloth is not seen from the profusion of ornaments. The white fustanelle, a small skirt of a thousand pleats, is the most original part, and the leggings as richly embroidered as the jacket. Their elegance is

renowned and their form has become popular—so much so, that we see them in pictures everywhere, and they are much used for masquerades. The most beautiful of the costumes were exhibited by Andreon and Tzenos, both for men and women. The costume of an Athenian rustic with his wife, of a new fashion, was sent by Magnissalis; that of a man of the Morea, sent by Zappas, and a costume of ancient Greece, that might be taken for that of Phedra, is perfect—tunic, peplum, and sandals, all of fine cashmere, embroidered with gold. It was said to be intended for wear, though one would not think so from its elegance. The same would not be said of the costume of the woman of Psara: the white silk turban, the waist of velvet, and the skirt of purple silk, were of the common form.

The Greek cases also contained parts of costumes of different provinces, varying according to locality, though with a general resemblance. They are dresses for daily use, their prices varying from twenty-five to two thousand francs.

RUSSIA.

Russia, with so many different people, might have sent more costumes to the Paris Exposition, but for an ethnographical exhibition at Moscow, where there were more than six hundred costumes. In the Exposition there were only twenty-seven from Russia, but they were choice, tasteful, and new to many. First among them was an Ostiak costume from Northern Siberia, near the mouth of the Obi, covered with furs. The man, woman, and children of the group are dressed alike. The fur of the skins is on the outside of the garments, as in all cold countries, to make them warmer. The bottom of the hood and the hem of the sleeves are ornamented with colored pearls from the north of China, making them really gorgeous.

The agricultural commission of Tiflis, Caucasia, sent a Tonchine man and woman, a Kefsaur man, one Cossack, and two Kurd uniforms. They differ from those mentioned above, in ornaments, in brilliancy of colors, and solidity of the material, which is manufactured in the country. The woman's hair is carefully plaited; she has a necklace of coins; the men carry splendid arms and wear riding boots, thus indicating the tendencies of the Eastern people.

The Crimea sent but one Tartar man and woman; their dress, very tasteful, is loaded with gold embroidery; the stuff is variegated, of cloth, velvet, silk, and muslin.

It is only necessary to mention the fish-skin costumes of the Yakouts and Aleutians, exhibited by Mr. Pavloff, and similar costumes of Laplanders from the grand-duchy of Finland. Russia might give us many samples from its tributary lands. It is to be regretted that a Russian countryman with his family was not seen, but, as each province has its peculiar dress, arbitrarily embroidered, it would be hard to find what could be called a Russian rustic. To have an idea of their taste we

have but to glance at the towels in the Isba, or in the woolen and linen section. Why were not such costumes sent? Perhaps because common things are not appreciated.

SPAIN.

Lay figures play a great part in the presentation of costumes, particularly if the costumes are short and narrow, and for that reason those sent from Murcia must be praised. They were of carved wood, with jointed shoulders; real painted statuettes, with enameled eyes. They show the dress of the males and females of Murcia to a great advantage; and are so elegant that they are readily accepted abroad as the general type of the whole country.

The provincial deputation of Coruña and the institute of San Isidro also sent some interesting specimens; but much more was expected from a country like Spain.

EGYPT.

Egypt had an exhibition of popular costumes, organized by order of his highness the Viceroy. The first portion, Class 91, was in cases; the second was on lay figures. They represented the farmer, the laborer, the negro of Upper Egypt, the Sais Berber, the Arab peddler, the Copt woman, the Abyssinian woman and the negress. The mannikins used were made of hard pasteboard, modeled by the sculptor Cordier. They were very well made, very graceful in their movements, represented their types perfectly, and did honor to their author. But that was not all that Egypt had to show. Quitting the palace and going into the park, might be seen the workmen just as they are at Cairo: the barber, the goldsmith, the embroiderer, the rush-mat maker, whose bronzed faces and herculean forms made a deep and lasting impression on the spectator, and caused him to forget for a moment the costumes before him.

ROUMANIA.

Moldavia and Wallachia had many costumes; fifteen of the principal ones were on figures. They represented the surongio, the postilion of Argech, the royal postilion dressed in white cloth covered with red embroidery. The herdsman, the pea-gatherer, the reaper of Arto, the Danube fisherman, the mountain hunter, &c., were characteristic costumes of the country. Then there were graceful female costumes, embroidered by Madam Odobesco and Madam Zucasiewitz, filling two large glazed cases. The bride of Turno was also observed, and portions of costume of admirable workmanship, and of such taste that an innate thirst for elegance in those people is palpable.

PRUSSIA.

The government of Saxe-Altenburg and Mecklenburg-Schwerin had a curious collection. The vestments of the bride of Altenheim were pecu-

liar—quite black, the wreath and bouquet of variegated flowers, and the stockings red. It seems they avoid white as carefully as it is sought in Paris. The husband wears a small Louis XI hat. A protestant population was discovered in these austere fashions; but what particularly attracted attention was the narrow skirt of a woman from the neighborhood of Erfurth or Gotha; it only reached the knee, and was buttoned tight in front; though it impedes walking, the wind can get no hold under it. A large number of specimens might have been sent, for the costumes of the married women are very different from the girls' dresses. This distinction was first enforced by law, and afterward became a custom, which has lasted to the present time.

AUSTRIA.

Austria, justly celebrated for its elegant Croatian, Servian, Moravian, Hungarian, Sclavonian, and Tyrolian costumes, disappointed many at the Exposition. Only partial representations, such as cloaks, pants, caps, and belts, and a few specimens on dolls were given. However, the costumes were well known, and have long furnished patterns to dramatic artists and painters.

THE ARGENTINE REPUBLIC.

The Argentine Republic had three groups, and the *gaucho* was the hero in all of them; he was on horseback preparing to throw his lasso, or had his woman behind him, or was sucking his *mate* through a silver *bombilla*, held up to him by a girl. His costume and the caparison of his horse had many silver spangles on them, and the whip handle, stirrups, bridle bit, and saddle pommel, were covered with silver, in justification of the name of the country.

TUNIS.

The Bey of Tunis sent a rider and horse in festive caparison, like those of the old tournaments; three Moorish costumes, the more curious as they showed the home dress of the Arab woman; and three male dresses, all richly and elegantly embroidered.

JAPAN.

Japan exhibited two lots; one from the Tycoon, the other from Prince Satsuma. Though separate, they were very much alike, both representing warriors, horsemen, and footmen, loaded down with arms, helmet on the head and shield on the arm. Their faces were hid by masks of hideous appearance; their arms were singular and odd in form, so as to terrify the enemy. One would think the entire costume was intended to frighten, from the fierce aspect it gave to the wearer. All the articles were carefully and elaborately fashioned, showing the skill of Japanese workmen.

DENMARK.

Denmark had four handsome country groups, men and women from the islands of Zealand, Amak, and Iceland, very like their neighbors the Swedes. One must belong to that country to discover differences that do not strike a stranger. There was, however, a singular detail of costume peculiar to them, which was initial letters of gold that the woman wears on her belt, her family name and her husband's combined, a symbol of fidelity placed near the heart.

PORTUGAL.

Portugal had a male costume from Honras de Miranda, in the province of Tras-os-Montes; it was brown in color, and was covered with black ornaments, with a blue vest. The cloak, with a scooped collar, is generally worn at festivals and weddings. The contrast between the jacket and vest was odd, but attractive.

The province of Minho was well represented by a large collection of small figures sent from Porto: among them were the farm laborer, the fisher, the water carrier, the Valongo and Avintes baker women, the fish woman of Espinho, and the embroidress of Braya, the lace-maker of the country.

The costumes of the province of Alentejo—brown dress, short breeches, broad brim hat—and those of the fine looking people of the Azores; those of Madeira, where we find the embroidress, the shirt-maker, the laborer, and the *vilon*, in his ruffle shirt and pointed cap of such a queer fashion—were wanting. But what can be said against this omission, when the Netherlands, the Pontifical States and Italy, all rich in varied costumes still worn, sent nothing? India sent nothing but a few small figures, very pretty indeed; Malta sent two life-size earthen statues, that looked as if intended for a garden; England, rich in all other classes at the Exposition, did not send her fine Scotch costumes. These ommissions were much to be regretted.

FRANCE.

France had forty-five exhibitors: sixteen had painted studies or designs well calculated to illustrate the type, fashion, and manner of dress in the provinces.

Raphael Jacquemin sent a beautiful work, a colored iconography of costumes from the fourth to the nineteenth century. Each plate was etched by himself and gave all the details most conscientiously. It is a work indispensable to libraries and very useful to artists.

The costumes on lay figures numbered seventy. It was hard work to make this collection, yet provincial varieties were far from being complete.

FINISTÈRE.—Jacob, of Quimper, exhibited country costumes of Brittany, as men and women of Scaer, a bridal pair from Plouaré; the

woman dressed in red, like the Roman *Campesine*, and a groom of Kerfuntun. These costumes, made on the spot, were richly garnished with gold and silver embroidery on silk and woolen; and what was most singular, the work was done by men. We can understand how proud the Breton is of this costume, and why he wears it yet: it is well made and showy, composed of various materials of excellent quality, and calculated to last long, a consideration highly estimated by an economical and industrious people.

Beside this lot, Mr. Jacob has inaugurated a new industry by appropriating Breton embroidery and trimmings to coats, vests and other garments used by men and women as traveling suits. It has been a benefit to the tailors of Quimper; and its success is proved by the extent of the business and the imitators of it that have suddenly sprung up.

The Loire Inferieure was well represented by a man and a bride from Clisse, and by a man and woman of Sailly. These were all the costumes exhibited from Brittany.

Puy de Dome.—Mr. Foulhouse was commissioned by his department to collect the costumes of Auvergne; this he did with the intelligence and skill of an artist and archæologist. There were ten types of the principal localities.

The woman of the Tour d'Auvergne, with her dark woolen head-gear, held on by a brass band, goes back to the Celtic period, if we may trust tradition, and might have been worn in the time of the Gauls when they conquered Alaric, near Latour. The brass fillet may have been taken from the head-dress of the conquered as the emblem of triumph, and the black stuff as the token of mourning, in commemoration of the death of their countrymen who died on the field of battle. A widow in that part of the country still wears the black veil, without the band, in token of sorrow.

A man and woman of Chapdes, Beaufort, finished the highland series of costumes. All these dresses are of blue woolen, and are made by the women of the country. They prepare the wool, spin it, weave it, and dye it at home. The importation of foreign articles at a cheap rate has tended to abolish this domestic manufacture.

The lower part of Puy-de-Dome, known as Limagne, sent a male and female costume of St. Bonnet, near Riom. The robe is of wool or cotton, and always of gayer colors than those worn in the highlands. It gives the elegant type of the women of Auvergne, whom all travelers in that province see dancing the *bourrée* on Sunday evenings. It is very similar to the dress in the district of Issoire, where the Sauxillange women still wear the tucked skirt, such as we see in Watteau's pictures. We also see the common dress of the people of Riom worn by the porters at the feast of St. Amble, the patron of the city, with the high-crown slouch hat, as worn by the *incroyables* in directory times. It was worn in Limagne only forty years ago.

In the valley of the Dare the vine dressers lived in common during

the last century, and were called the *Guitard Pinon*, from the chief who wore a red velvet belt with a silver buckle containing the emblems of agriculture, given to him by the king's intendant in the reign of Louis XVI.

The women employed to tend flocks and herds still wear a broad-rim straw hat worked with their own hands. This hat is tied over the head with a ribbon, and is a perfect protection from sun and rain. The pleats of their coarse woolen gowns are formed by the strokes of a mallet, which is one of the necessary instruments of the tailor.

The section of Puy-de-Dome was finished with a collection of archæological objects connected with the history of costume. The first seen was a bundle of distaffs of carved wood, painted by the mountain shepherds. They came from villages near Clermont, and were fashioned like those used in the Pyrenees and in Algeria. The next object was a Celtic belt, very curious, from the village of Corent, once a walled town of Gaul. On the medals connecting the brass links were crosses carved by hand to consecrate the articles. They must go back to the time when Christianity was introduced into Auvergne by St. Austremoine. These chains were used up to the commencement of the present century to carry house and trunk-keys on. There were also clasps, buckles, and sleeve-buttons of Celtic origin, and these are now imitated in sleeve-buttons with Vercingitorix's horse stamped on them. The old jewelry of Auvergne, that will certainly come into fashion again, must also be mentioned.

VENDÉE.—La Vendée was portioned into three sections, the woods, plain, and sea-coast. The committee went to a great expense in the exhibition: it sent three genuine costumes, but all tended towards the same model except the winter cloak of the St. Gervais fish-women and the women's caps, much like those of Rochelle. The men's dress is more original; it is the true type of the old Vendean with his broad hat, short coat, and tight breeches; no socks, but straw in his hard, heavy, wooden shoes. The costume is not often seen now, but it is very characteristic.

The Lower Pyrenees had three specimens from the valley of Ossau; the women wore a flounced skirt, high gaiters, and a red hood; two herdsmen had red caps; one was knitting as if watching his flocks; the other had a lute and flageolet, and he played both at once.

ARIÉGE.—Baron Bardis sent a male costume from the valley of Oust, a man and woman from the valley of Massat, and a woman from the valley of Bethmale. These costumes are still worn in the contiguous valleys, and the cloth is made in the country. In the snow mountains the leg-gaiters leave the knee-joint free, so as not to hinder progress through the snow, while they protect the lower leg. Men wear the broad hat common to the country, or the cap called the *berette*. In winter the women add a hood to their cloaks to keep their heads warm.

LOWER RHINE.—The department committee sent a man and woman

from the neighborhood of Strasburg, and two costumes from the vicinity of Wissemburg; but Alsace might have sent many more. These came from a Protestant region, as might have been seen from the woman's deep green petticoat and the man's vest of the same color. Catholics always wear red.

CHER.—Berry had also many souvenirs, chiefly from Asnières-les-Bourges, a small village three miles from the capital, where the people are Protestants. The manners and customs of that part of the country have not altered since the edict of Nantes. The old men still wear the dress of the time of Louis XIV, and yet they all know how to read and write. It is singular they are so attached to the dress of the olden time.

LOWER CHARENTE.—Mr. Fournier sent a Rochelle and Marenne female costume, with magnificent head-dresses, made of tulle and lace, resembling those of La Manche, exhibited by Mr. LeMaillier. They had a domestic look to the eye of a stranger, and were very different from those of Normandy. The head-dress tells the province here and it becomes a science, but it is unfortunate that we see the Norman bonnet now only on the heads of old women, and on Sunday another obsolete head-dress, found chiefly in the departments of the Aube, was called the *tocca*. It might be called a large crown of lace, very pretty and graceful in form.

YONNE.—The departmental committee sent a country costume of Avallon, the general type in all the central departments of France, and well known in Paris through the Morvan nurses that have made it popular. This coquettish costume requires a good figure to show it.

The house of Babin furnished several well-made costumes for the Exposition; among the most notable were a girl of Guéméné, one of Bressanne, and a Corsican laborer.

We must give a few words to the cases containing the jewels. Most of them, as the Norman crosses of General Hecquet and Mr. Singer, are of Alençon silex; they are collars, brooches, and ear-rings of Provence and Dauphiné. These adornments of the last century have become rare, and are only found in the hands of amateurs. The articles of provincial gold jewelry, still sold in remote districts, are quite interesting as curiosities in Paris, and show the difference between what was formerly used and what is now made for fashionable people. We would recommend the adoption of these old fashions for the benefit of modern industry.

CHAPTER II.

MATERIALS FOR CLOTHING REPRESENTED AT THE EXPOSITION.

COTTON FABRICS FROM FRANCE, GREAT BRITAIN, AND OTHER COUNTRIES—COTTON MANUFACTURE IN THE UNITED STATES—LINEN AND LINEN FABRICS, ENORMOUS CONSUMPTION OF, IN FRANCE—VARIOUS STYLES OF LINEN GOODS SHOWN IN THE FRENCH SECTION—RELATIVE IMPORTANCE OF THE LINEN MANUFACTURE IN VARIOUS COUNTRIES—FLAX AND LINEN IN ITALY—MANUFACTURE OF WOOL AND WORSTED—THE BRITISH ARTISANS ON WORSTED AND MIXED TEXTILE FABRICS—SILK AS A MATERIAL FOR CLOTHING—THE SILK TRADE OF FRANCE—SERICULTURE IN FRANCE—GENERAL OBSERVATIONS UPON THE SILK INDUSTRY OF VARIOUS COUNTRIES—RIBBONS.

COTTON FABRICS.

In the present age, cotton fabrics being the cheapest and most universally used materials entering into the production of clothing, are naturally the most important to the largest mass of consumers.

France, being very properly ambitions to have every department of her wonderful industrial interests well represented in an exposition projected and carried out in her great metropolis, surpassed all other countries in completeness of exhibition in this department. For the same grade of goods made by other nations, the French, as a general rule, use a better quality of cotton, aud twist their yarn more evenly and with a harder twist than other mannfacturers.

In all grades of shirtings, fine cottons, calicoes, lawns, and muslins, the French maintain an acknowledged ascendency. Their exports of these goods for the five years euding with 1865 were as follows: 1860, \$13,920,000; 1861, \$11,280,000; 1862, \$12,660,000; 1863, \$17,640,000; 1864, \$18,740,000; 1865, 18,700,000; and 6,250,000 spindles furnish the yarns from which these fabrics are woven.

It appears that, from some cause or other, many leading staples of the cotton mannfacture of Great Britain were not represented. But the capacity of British manufacturers to meet the reqnirements of the world at large is attested by the facts that she exports of yarus over \$50,000,000 worth, of calicoes over \$115,000,000, other printed goods, \$80,000,000, and of sewing cotton upward of \$3,000,000—in all a valne of \$248,000,000; yet none of these branches of the trade were represented to any extent in the Exposition.

Our own manufacturers in this department of industry declined to appear; a case of sewing-cottou from the Clark Thread Compauy being the only article exhibited in the class of mannfactured cottons.

The Oriental nations, with the exception of Persia, were scarcely represented. Persia contributed, after the date at which they should have

been received, some very rich fabrics, among which were some printed goods in the traditional style of the country.

Italy, Russia, Sweden and Norway, Spain, Switzerland, Austria, Wurtemberg, Baden, Prussia, and North Germany, Belgium, and the Netherlands, were all more or less extensively present in the examples of this class, and generally with credit to themselves.

The manufacture of cotton goods is the most prominent feature of the textile industry in Wurtemberg. This branch has been developed mainly within the past fifteen years, and supports twenty-one establishments engaged in cotton-spinning, employing about 245,000 spindles, and 3,550 hands; consuming 5,600,000 kilogrammes of raw material, valued at $3,222,613 84.

COTTON MANUFACTURE IN THE UNITED STATES.

The very comprehensive report of my colleague, Commissioner Nourse, renders the presentation in this place of statistics of the cotton supply and manufacture of the United States superfluous. It will be sufficient to direct attention to the fact that the country did not make that display of cotton manufactures which justice to this important industry required; and also to the fact that notwithstanding the great increase of production of all kinds of cotton goods, the demand is not supplied.

The average annual value of foreign cotton manufactures imported, from 1821 to 1839, inclusive, was $10,624,687; and from 1840 to 1856, inclusive, $16,795,418; the yearly exportation for the same period averaging only $909,114. From 1854 to 1856, the average annual imports amounted to $28,811,966. These values, during the later periods, consisted largely of piece goods from Great Britain. Of plain white British calicoes alone our importations increased from 10,000,000 of yards in 1846 to 85,000,000 in 1856, and of printed or dyed calicoes, from 13,500,000 yards in the former to 97,000,000 yards in the latter year; and in 1860 we received from that country altogether 226,776,939 yards of cottons; but in the first two years of the late civil war, 1861 and 1862, this importation creased to 74,680,537 and 97,375,709 yards, respectively.

This industry, so vast and important to this country, and which deserved so prominent a place at the Exposition of 1867, was practically unrepresented there. It is not, however, to be inferred from this omission to appear in the greatest of industrial competitions, that the American manufacturers lack confidence in their ability to compete in the quality of those classes of cotton goods which form the great staple fabrics demanded by the masses of mankind; but a vague impression that the relative cost of production was to be taken into account in deciding upon the question of comparative merit, seems to have influenced them in withholding their fabrics.

The very general and earnest efforts which have been and are being made by the government and manufacturers of the United States to ameliorate the condition of the laboring classes by the payment of

liberal wages, the reduction of the hours of labor, and the diffusion among them of all means tending to their elevation and moral, social, and intellectual improvement, render it impossible, and it is considered undesirable, for American manufacturers to compete with those of foreign countries in the cheapness of manual labor.

It is to be regretted, however, that they did not present a complete exhibition of this class of goods, had it only been for the benefit of such criticism as competent and faithful experts would have made, as well as for the *eclat* which they might have shared with some of our woolen manufacturers in bearing off golden rewards of success.

The number of gold medals awarded in this branch was twenty-six; of which, France received fifteen; Great Britain, five; Switzerland and Belgium, two each; Austria and Prussia, one each.

Of one hundred and thirty-seven silver medals, France took seventy-five; Switzerland, thirteen; Austria and Prussia, twelve each; Belgium, seven; Russia, six; Great Britain, five; Saxony, Holland, and the United States, two each; Spain, one. The bronze medals being distributed in about the same proportion.

The countries represented, and the number of exhibitors from each, in Class 27, Group VI, being cotton yarns and fabrics, are as follows:

Country.	Number of exhibitors.	Country.	Number of exhibitors.
France	228	Denmark	1
Algeria	12	Sweden	7
Holland	15	Norway	2
Belgium	69	Italy	47
Prussia	47	Turkey	198
Hesse	1	Egypt	1
Bavaria	2	Tunis	1
Wurtemberg	11	China	1
Austria	36	Loo Choo	1
Switzerland	55	Morocco	1
Spain	14	United States	4
Portugal	8	Great Britain	31
Greece	8	British colonies and dependencies	4

LINEN AND LINEN FABRICS.

Naturally succeeding cotton comes linen, the production of which was visibly stimulated during the civil war in the United States by the sudden and protracted interruption of the supply of cotton. The results of this stimulation were manifest in the linen exhibits of the Exposition. France devoted a larger space to this than to any other single industry, in her section of the building, as did also Belgium and Prussia. It was stated in a report to the Chamber of Commerce of Belfast, Ireland, by a deputation sent to the Paris Exhibition of 1855, that the annual consumption of linens in France then amounted to two hundred and fifty

million yards—a larger quantity than is used in any other country—and French statistics show that on the 1st of January, 1866, there were in that country two hundred and twenty-six linen mills, containing 705,350 spindles, and that in the Departement du Nord there were 4,305 power-looms; since which they have been increased, so that in all France there cannot be less than 8,000 power-looms engaged in weaving linen. Added to the supply from this source, an importation was reported for 1866 of 3,800,000 pounds of yarn, and 3,500,000 of linen. Among the principal styles of linen fabrics for clothing purposes exhibited in the French section are the various types used in the naval and military services, in which, as well as in hospitals and prisons, the French adopt the use of linen instead of cotton. Then come blouse linens, blue, drab, and slate-colored, and of various shades. These with French fancy drills, which are largely exported, light linens, and linen handkerchiefs, from the Cholet district, and damasks, were the most notable varieties exhibited. Belgium, Prussia, North Germany, and Austria were represented in a manner showing that this industry is well maintained among them; but Great Britain established a claim to undisputed pre-eminence. Her exports of manufactured linen for six years preceding 1867 were, for 1861, over \$17,960,000; for 1862, \$22,900,000; for 1863, \$29,330,000, and upward; 1864, over \$37,525,000; 1865, \$41,220,000, and upward; 1866, \$44,425,000.

EXTENT OF THE LINEN INDUSTRY IN VARIOUS COUNTRIES.

The following table, indicating the number of spindles in activity and in construction at the commencement of the year 1865, gives an idea of the relative importance of the linen manufacture of each of the principal countries engaged in that industry:

Country.	In activity.	In construction.	Total.
Great Britain	1, 263, 000	195, 638	1, 460, 638
France	563, 025	60, 000	623, 025
Belgium	135, 000	60, 000	195, 000
Russia	75, 000	19, 000	94, 000
North America	80, 000	20, 000	100, 000
Austria	210, 000	116, 500	327, 300
Prussia	151, 000	24, 500	175, 500
Saxony	15, 000	6, 000	21, 000
Bavaria	6, 200	1, 000	7, 200
Wurtemberg	4, 000	....	4, 000
Total	2, 505, 025	502, 638	3, 007, 663

Ireland produces very good qualities for the spinning of medium numbers. Russia exports considerable quantities, principally from Riga. Her linens are pliant and easily worked, but they never bleach to a perfect white. They serve for the coarser numbers only.

Algeria has entered successfully upon the culture of flax. The progress in this culture which she has made under the benign guidance of science as perpetuated in the mother country, is illustrated by the fact that the specimens which she exhibited in 1855 were not adapted to the production of finer yarns than English No. 25, (17 millimetres, French,) while those in the Exposition of 1867 were perfectly capable of producing threads of No. 100.

In France, linen fabrics are manufactured principally in the Departement du Nord, Picardie, the environs of Bernay, and in the Pays de Caux. The linens of this last district as those of Picardie are of inferior quality. Those of Bernay and du Nord, although superior, do not equal in quality the linen of the Lys, (Belgian,) that are gathered in the environs of Courtray, and which are all of highest grade. The environs of Gand, Lockeren, and Malines, furnish also linen fiber of a quality perfectly adapted to yarns or threads of fine numbers.

The annexed tabular statement shows the magnitude of the linen industry of Belgium from the years 1855 to 1864:

Year.	Importation.		Exportation.	
	Quantities.	Value.	Quantities.	Value.
	Kilos.	*Francs.*	*Kilos.*	*Francs.*
1855	12, 464	175, 000	2, 762, 587	12, 467, 000
1856	10, 000	167, 000	3, 485, 024	15, 832, 000
1857	13, 190	303, 000	3, 549, 901	29, 165, 000
1858	13, 858	364, 000	3, 418, 752	27, 704, 000
1859	16, 884	320, 000	3, 381, 423	27, 396, 000
1860	15, 593	329, 000	4, 230, 458	26, 741, 000
1861	10, 714	334, 000	4, 495, 007	28, 281, 000
1862	11, 879	548, 000	4, 412, 859	29, 132, 000
1863	16, 353	594, 000	4, 228, 528	33, 097, 000
1864	19, 285	619, 000	4, 243, 602	41, 061, 000

FLAX AND LINEN GOODS IN ITALY.

The production of flax in the kingdom of Italy is estimated to be about 135,000 metric quintals,[1] that of hemp about 500,000 metric quintals, in all 635,000 metric quintals. The principal varieties cultivated are the ordinary hemp, the Chinese hemp, and giant hemp; the stalks of this last variety sometimes attain a height of five metres, (sixteen feet.)

This product forms quite an important item in Italian commerce; the imports and exports for the years 1862, 1863, 1864, and 1865, averaged respectively 16,956 metric quintals, valued at 1,600,000 francs, and 157,033 metric quintals, valued at 15,324,000 francs. Three-quarters of the exports go to Austria, principally in a raw state. During the three years 1863, 1864, and 1865, the imports of hemp made into cordage averaged 11,130 metric quintals, valued at 878,000 francs, while the

[1] The quintal = 100 kilogrammes, or 220.46 pounds.

exports for the same period averaged 15,356 metric quintals, valued at 1,658 francs.

The spinning of flax and hemp is still generally done by hand, there being but few factories in which power is used. There are, however, three in Lombardy, having in all 14,120 spindles and giving employment to 980 persons, of whom 245 are men, and 735 women and children.

The wages for the women and children vary from twenty-five to forty-five centimes per day; that of the men from one franc thirty-two centimes to two francs per day.

The quantity of flax and hemp which is consumed in these establishments is 12,500 metric quintals, from which is produced 9,000 metric quintals of all qualities. To the work which is done in the factories must be added the work done with hand looms by 300,000 peasants, who are employed in spinning one hundred and fifty days during the year. Their average earnings are fifteen centimes a day, and the whole amount paid annually for this work is 6,330,000 francs.

The city of Bologna possesses two factories capable of producing 5,000 metric quintals of thread per annum.

The amount of hemp and flax spun in Italy is not sufficient to supply the home consumption. The greater part of this material is exported in a raw state, and returns in the form of thread, having been spun in the great factories of England and France. The average exports and imports of thread for the years 1862, 1863, 1864, and 1865 are as follows: Exports, 3,042 metric quintals, valued at 789,000 francs: Imports, 29,575 metric quintals, valued at 7,772,000 francs. In weaving linen there are employed 120,000 looms and 171,000 workmen. The entire production may be valued at 60,000,000 francs per annum. There are many factories established in Piedmont, in Lombardy, and in the southern provinces, but in the country there are local manufactures which supply the home consumption.

The fine linen used in Italy is almost all imported. The importations from France and England have increased of late years to a great extent, while the exports have fallen off proportionately; the average imports for three years, from 1863 to 1865, inclusive, being 14,924 metric quintals, valued at 8,287,000 francs, against 5,666 metric quintals, valued at 2,097,000 francs, exported during the same period.

MANUFACTURES OF WOOL AND WORSTED.

In an economic point of view, and as a branch in which the national taste, skill, and thoroughness of workmanship were brought to the test, this feature of the Exposition was not surpassed. France and England vied with each other in presenting to the admiration of the world series of tissues of great beauty and utility for female wear, such as double merinoes, poplins, beaded stuffs, figured and fancy goods, material made from the wool of the Angora goat, printed merinoes or cashmeres, and de laines, heavy Orleans cloth and alpaca, mixed goods made from fine

organzine with silk warp, and weft of mohair, the last named being exhibited only by the French. It is a gratifying fact that although the United States were not represented in these fabrics, her enterprising manufacturers are gradually entering the same field and that her stock-raisers are paying more and more attention to the growth and improvement of wools, so that we are in a fair way, at no distant day, to compete handsomely with Bradford and Rubaix, the respective centers of these industries in England and France. The latest and most valuable information on the woolen industries may be found in the report of Mr. John L. Hayes already referred to.

Austria, Prussia, and Saxony displayed a more limited range of similar fabrics, so also did Russia and Belgium, all of which received high commendation.

As in the spinning of flax, France shows in the production of the fine yarns necessary for all-wool goods and wool and silk goods the qualities which give to her fabrics woven therefrom their undisputed superiority. England, however, excels in her mixed fabrics, from a similar superior practice in preparing the yarns from long wool, which requires processes of treatment differing radically from those for spinning carded wool.

Another quite distinct branch, namely, that of carded wool and woolen fabrics, upon which wearing apparel of both sexes is largely dependent, remains to be noticed, before we reach the more delicate and luxurious materials. Here again we are filled with admiration of the beauty and variety of the French representation. The complete system of industrial education will, no doubt, account for the thorough skillfulness of manipulation in spinning and weaving, as it does for the taste and fertility of design displayed in French fabrics. In figured coatings, Moscow beavers, sable furs, and Witneys, France verifies the importance of this system of education and her velvet piles and naps of wool and Astrakhans for ladies' mantles are unrivalled. France exhibits also the novel combinations of velvet cloth adorned with glass, steel, and gold beads, and brass shavings, and cloth made from felted yarns, which are beautifully soft and elastic and not dear in price; and makes a very excellent display of fine cloths and beautiful examples of fine fancy trouserings, worthy of the source of their production. Prussia, Austria, Holland and Belgium, Russia, Italy, and Turkey, all figure respectably in the same line, and in some qualities attain preeminence: for instance, Belgium for heavy overcoatings, such as ribbed cloths, reversible beavers, Moscows, deer and doe skins, and other ribbed cloths; Austria for the brightness and clearness of dyes, and original and tasteful patterns.

The strong point in British woolens is the superior quality of superfine broadcloths, cassimeres, doeskins, and beavers, which especially are unsurpassed.

Huddersfield, one of the greatest centers of production, exhibits coatings, trouserings, vestings, mohairs, imitation skinrugs, and velvet piles, of moderate cost, yet excellent in quality. Scotland sent a varied col-

lection of trouserings, shawls, and the soft, beautiful and durable fabrics for which she is celebrated; and Ireland some good tweeds, freezes, and trouserings.

WORSTED AND MIXED TEXTILE FABRICS.

The following is an extract from the report made by Daniel Illingworth, of Bradford, England, one of the British artisans, and published by the Society of Arts:

"After taking a general survey of the exhibition, we began looking at the Bradford goods. We found various makes, including lastings, camlets, cords, a few Coburgs, Orleans, various stripes and mottled fabrics; nothing made for the special purpose of show, but goods taken from our present stocks. Similar goods can be seen in our market at any time. They are made from cotton, wool, and silk.

"In looking over the fabrics of continental manufacturers, the French, I must say, are superior to any other, both in quality and dye. No comparison can, however, be fairly instituted between goods made of all wool, wool and silk, and goods made of mixed wool and cotton.

"We were told in France that we could not dye merinoes; that when they sent them in the gray to England, they had to be sent back to Paris to dye and finish. Their merino weft and warps are carded and spun without oil, to which is attributed the deficiency of our shades; but if we cannot dye the French goods, which are without oil, our dyers must find some other excuse.

"In looking over the French goods in the all-wool, wool and silk, the merinoes are particularly good. The reps made of all-wool, wool and silk, are beautiful. They have also the plain poplin, all-wool, which is also good; of these they have an enormous and most varied display. No prices were affixed to the French goods in this class, but from the fineness of the quality they must be very costly. They are goods that will not be extensively made in England. The competition is so pressing that we are obliged to make a cheap article.

"The collective show of Roubaix was good. Upon inquiry we found that they had been made expressly for show, regardless of expense. This contains goods similar to the Bradford manufactures in mixtures of cotton, wool, and silk fabrics, but nothing new in design.

"Messrs. Delattre, sr. & Co. had a first-class show of merinoes, poplins, reps, and mottled fabrics, which had been made regardless of cost and of superior material to any that I saw afterwards in the working process.

"The goods shown from Roubaix are superior to ours in quality.

"On visiting Roubaix we encountered much difficulty in gaining admittance to the places of business; and where we were allowed to see the combing, drawing and spinning, we were not allowed to see the weaving; and only in one instance did we succeed in doing so, but in that we found nothing to learn. In Roubaix we found some of the lowest classes of wool in process, and spun into weft.

"We next went to the manufacturing town of Rheims, where we were well received. We visited several firms in the town and district. There are made poplins, reps, and cashmeres and merinoes, the last named being the principal manufacture. We visited the firm of Dauphinot and Brothers, who have a good show in the exhibition of reps, cashmeres, poplins, yarns, tops, wool, &c., but merinoes are their principal make at present. The woolen warp is spun in single threads, on caps; then it is taken and twisted two-fold on a roving bobbin, from which it is warped onto a beam to form one sixth of the warp; then it runs from the six beams onto one, and as it runs from the six beams it passes through a size of glue and water. When it comes out of the size every end is separated and dried with two fans before it reaches the beam, and all this is managed by one girl. There are no dressers, no warping mills, and very little labor attending the process. This method of sizing and beaming is nothing new; it is similar to the cotton process.

"There are both one and two-loom tenters; but as far as we could see and learn, quality is more sought after than quantity. We noticed a first-rate machine for finishing or cleaning knots from the face of merinoes and other fabrics. By this machine the superfluous ends, &c., are shaven off, and at the same time the ground is raised, by which process a richer appearance is given to the cloth. This machine is in the form of two going parts of a loom, and works the same way. The pieces pass over the surface of the going part, where a peculiar knife is fixed, which takes off all the fibers. A great number of women are also employed to clean the pieces, and every care is taken to make them as perfect as possible. In one piece room were fifty, and in another twenty-five, of those women employed. If an end was out it was sewn in, and all ends or fibers cut from the edges and superfluities of every kind cleared off.

"We visited the firm of Messrs. Seydoux, Sieber & Co., Le Catian. This is the largest firm in France. We noticed their case in the exhibition. It consisted of reps, poplins, cashmeres, and merinoes; a really first-class show.

"We noticed a very good case from Prussia, of goods similar to our own.

"With regard to machinery, we found it very difficult to gain admittance to the French department. At last, however, we succeeded, and on examining the looms we did not find anything to learn. There was the plain and drop box loom, but nothing new, and none equal to the Yorkshire looms for the Yorkshire trade. We consider it unnecessary to dilate upon the excellence of our looms.

"In the Exhibition we were indebted to Messrs. Larsonnier Brothers & Company for the opportunity of examining several cases of French goods. They very kindly opened, not only their own case, but others for our inspection, and also gave us samples.

"There are few goods exhibited by the continental manufacturers for the use of the middle and working classes. The Bradford goods are

most suitable and substantial; and the surprising cheapness of these fabrics it is hoped will attract the attention of our foreign merchants in this class, and obtain from them a due appreciation, and stimulate a demand for our goods."

SILK AS A MATERIAL FOR CLOTHING.

The opportunity presented at this Exposition for the study of the production and the products of silk, was probably the best ever offered to the world; for the competing exhibitors in the French section, relying on their ability to keep in advance of all rivals in a manufacture so entirely dependent upon individual skill, which may be regarded with them as an accumulated heritage descending from one generation to another, eagerly revealed, in compliance with the requirements of the Imperial Commission, all the methods and processes of their industry.

To no country, in its bearing on national industry, wealth, and taste, is the subject of more urgent moment than to the United States, and the opportunity has been well improved by my able colleague Elliot C. Cowdin, esq., of New York, who has so exhaustively discussed the subject of the production and treatment of the raw material, as to leave scarcely anything to be said on this branch of the subject.

The rich stores, in the French section, of silk materials are many of them marvels of beauty in color and design. Though the newly discovered colors now extracted from coal tar and oil, known as aniline colors, have done much in this direction, the artistic taste and feeling developed by the admirable system of technical or industrial art education, which, as before intimated, lies at the basis of French pre-eminence in the fabrication of articles of elegance or luxury admitting of the application of design, has done still more.

In silk, which has such a remarkable capacity for receiving colors, and at the same time retaining its sparkling freshness and power of reflecting light, the knowledge of design and of the proprieties of color is even more important than texture and quality of material.

Artistic designing is itself an important industry in Paris, and is liberally consulted by the manufacturers, who thereby maintain novelty and excellence in their tissues, shawls, brocades, ribbons, and embroideries.

Lyons and St. Étienne were shown, by their specimens at the Exposition, to be the seats of highest development in the silk manufacture. This was demonstrated by the collective exhibition of the Association des Tisseurs de Lyons, and the superb tapestry or damask silk contributed by Messrs. Pillet-Meauzé et Fils, (102,) as well as that of Messrs. Methevon and Bouyard, (148,) of regal richness; by the specimen of taffeta brocaded silk with lace patterns enriched by garlands of flowers, and also a taffeta silk with velvet representing birds, flowers, and feathers, imitating nature so cunningly as almost to deceive the eye.

Some impression of the beauty of design attained in the manufacture

of woven silk may be derived from illustrations, but they can give no idea of the crisp fresh gloss and play of light and shade, nor of any of the delicate qualities which make silk what it is when the highest workmanship, skill, and taste have been bestowed on its production.

The relative position of Great Britain to the other silk manufacturing nations, was not perhaps justly presented at the Exhibition, but the most favorable exposition of her products in that line would leave her far behind France. Moiré antiques, Irish poplins, black crape, and plain and glacé silks of good quality each in their grade, illustrate the general tendency of British manufacturers to supply the substantial fabrics of established quality generally demanded by the great mass of consumers, leaving the French to supply the more ornate and elaborate varieties called for by the classes who lavish wealth in keeping pace with the fleeting fancies of fashion. One very rich material of the kind known as *tissue de verre*, for furniture and curtains, reflected credit upon the exhibitors, Messrs. Grant and Gask, of London. It was brilliant with fine spun glass, which is getting to be much used in decorative tissues. The great London Exhibition of 1862, at which the English displayed marked progress over her former exhibitions in silk manufacture, as well in design as in other qualities, seems to have stimulated France to renewed vigor and originality, while the subsidence of the English would convey the idea that they had formerly made, by a spasmodic effort, exceptional specimens for the purpose of carrying off the prizes. Professor Leoni Levi, L.L.D., in his able and instructive report upon the silk manufactures at the Exposition to the British government, gives the following statistical information upon this subject:

"Within the last twenty-five years there has been a great oscillation in the imports of raw silk. In 1840 the imports amounted to 3,759,000 pounds; from that time they increased enormously, till in 1860 they reached 9,200,000 pounds. But afterwards there was a considerable decrease, and in 1867 they were not more than 5,800,000 pounds." He then shows that the disease in silkworms caused a great competition in the purchase of China and India unmanufactured silk, causing a rise of from eighty to one hundred per cent., and that in an industry where the raw material enters so largely in the total value, such a rise left but little surplus either for labor or capital."

He further observes:

"Following the unsatisfactory condition of the raw material, the exports of British silk have suffered greatly. In 1846, when Sir Robert Peel reduced the duty on silk manufactures from thirty per cent., as it was left by Mr. Huskisson, to fifteen per cent., the value of exports amounted to no more than £608,000. From that time it increased regularly, till in 1856 the value amounted to £1,758,000. Soon after, the disease in silkworms appeared, prices rose, and the cheaper descriptions of silk became dearer in proportion than similar articles in wool or other materials.

"Then, too, in 1860 America, our chief market, became the prey of a fearful civil war, and the exports fell in 1861 to £1,395,000, and from that time they further fell to £1,028,000 in 1867. Even the six months ending July, 1867, showed a considerable diminution as compared with the similar period in 1866. To a certain extent the check to the prosperity of the manufacturer has been as much felt in Lyons as in Spitalfields and Manchester; but while England did not get the better of it, France did. Of ribbons, for instance, in 1851 the export from France amounted to £1,200,000; in 1855 they rose to £4,700,000; and in 1861 fell to £1,800,000; but they have since recovered to £3,500,000 in 1866.

"The silk trade of France, as a whole, exhibits a very different progress from that of England as regards the exports of silk manufacture. When the two are placed side by side the comparison is very striking:

Year.	Exports from England.	Increase per cent.	Exports from France.	Increase per cent.
1851	£1,130,000	....	£7,350,000	....
1855	1,082,000	4	9,650,000	31
1861	1,395,000	28	11,560,000	20
		Decrease.		
1866	1,318,000	5	1,850,000	63

"The difference between France and England from 1851 to 1855, and from 1861 to 1866, is very notable.

"What, however, alarms the British manufacturer is the fact, that while the exports of British manufacture decreased, the imports of French and other foreign manufactures have greatly increased. In 1855 the real value of foreign silk manufacture imported was only £1,800,000. In 1860 it was £2,800,000; and in 1867, £8,000,000. There is nothing surprising in the fact of such increase, the diminution or abolition of import duty being always followed by a larger trade, by which the community at large is benefited. Only in this case the natural result was more sudden, from the fact that just when we opened our ports, the American markets being closed, a large portion of French and German silk, which would otherwise have been sent thither, found its way to this country.

"From these accumulated evils the manufacturer in this country has been placed under no ordinary straits and difficulty, and there is no doubt that thereby the ability of England to compete with France in certain descriptions of silk manufacture has been greatly put to the test."

SERICULTURE IN FRANCE.[1]

Sericulture is not so prosperous as it was in 1855, on account of the silk-worm disease. Although it has long been known, its disasters

[1] Extract (translation) from the report of Jules Raimbert, of the International Jury. Rapports du Jury International, tome quatrième, p. 162.

in France began after the Exposition of 1855 and spread over all silk-producing countries. For eighteen years, every remedy has been tried in vain to arrest its ravages.

The silk crop in France, previous to the epidemic of 1840–'48, was estimated at twenty millions of kilogrammes of cocoons, worth, at the average of five francs, one hundred millions of francs. At that time one ounce of eggs yielded thirty kilos of cocoons, and seven hundred thousand ounces of eggs were required for France.

Now more than a million ounces of eggs are put to hatch, to allow for losses, and they only yield an average of ten million kilos of cocoons, bringing fifty-eight millions of francs. This is a loss of forty-two millions; and it is more evident if we compare the quantity of raw silk formerly produced, and that produced now. Then, the quantity produced was nearly two million kilos, costing seventy-two francs the kilo; the yield now is not over six hundred thousand kilos, but the price has arisen to one hundred and twelve francs. Thus, silk is from sixty to one hundred per cent. dearer than formerly, and its production has diminished two-thirds. To supply this deficiency, silk is imported.

At the time of the Paris Exposition of 1855, domestic silk was used to the quantity of eighty per cent. Lyons and St. Étienne were the two centers of the flourishing manufactures.

At the time of the London Fair of 1862, the silk crisis was at its height, and silkworm eggs were brought from Caucasia and the lower Danube to supply the business in western Europe. In 1865, such was the scarcity in France, that seventy-five per cent. of silk was imported; and in 1867, when the Exposition opened, the silk industry was in a desperate condition.

Subsequent to 1862 another important event had occurred: the early cocoons of Europe had died out and fresh eggs had to be brought from the East, chiefly from Japan. The cocoons of that country are of an inferior quality, and are often double. They are yellow, white, green, gray, and generally smaller than ours, thus making their manipulation more difficult. A good spinner formerly made three hundred and forty grammes a day; now she hardly makes two hundred.

SPINNING AND MILLING.

The position of the silk spinners was becoming critical, from privations of sources of former prosperity, and contention with unknown rivals; and milling suffered from the same causes. The quality of the raw silk became inferior, and its winding difficult; its manufacture became more expensive, on account of the working classes of the country flocking into the towns. From 1862 to 1867, the cost of labor rose as much as twenty per cent.

But in spite of the bad material and against all difficulties, we are proud to say that France is still at the head of the silk-producing countries. The spinners and millers of Ardèche, Drome, and Vaucluse form

a phalanx unrivaled for the manufacture of organzines, plush, and satin. The number of these factories is about the same as in 1862; for we found the same houses exhibiting at the late Exposition that exhibited at the London Exhibition in 1862.

The spinneries of the Cevennes keep up their reputation for their silks. They have had to contend with Japan, that shows many elegant specimens in cases, such as green silk, which is now taking the place of white and yellow. What was injurious to the spinners of pure silk, proved beneficial to those that worked the tow and refuse of silk. Owing to the high price of silk, that industry has increased considerably in France, Switzerland, Italy, and England, particularly for three-ply cord.

Considerable improvements have been made in the preparation of this material, before combing and in the subsequent manipulation of it; and they have raised the price of tow, which is now used for many articles that used to be made of pure silk. Paris and Nîmes furnish the best specimens of sewing silk, and silk used for embroidery and fringes. In spite of the obstacles that scarcity of the raw material has thrown in the way of this industry, it has prospered.

Winding has also improved by now furnishing skeins of regular size and quantity. Specimens were first exhibited in 1855, but now skeins are made very large for the use of sewing machines, that have come into use since that time.

The scarcity, and, as a natural consequence, the dearness of all sorts of silk, have given a real importance to that kind called *douppions*, once used in ordinary fabrics only, but now made up by many Paris houses, some of which make it a specialty.

The little business of winding, spooling, and balling silk, has reached an importance through machines that have cheapened the processes, once so tediously performed by hand.

Though outside of our line, we cannot refrain from mentioning the improvements made by the dyers of Paris and Lyons. The chemists and dyers of those cities have made discoveries of new coloring materials, called aniline, fuchsine, &c., that have produced wonderful effects. The exhibitors of those cities had purple, violet, blue, and green silks at the Paris Exposition, unequaled by any colors heretofore displayed at fairs. Twenty years ago, the French blue and black silks were the most admired as fixed colors.

The production of silk has not succeeded well in our African colony, Algeria; many cocoons and a few tissues were sent to the Exposition; there was but one specimen, however, that could compare with the silk of Lyons.

GENERAL OBSERVATIONS UPON THE SILK INDUSTRY OF VARIOUS COUNTRIES.

In glancing at the silks sent by different countries to the Exposition, we can study the character of the people that produce them without going to their homes to see them.

At the first Expositions the rival efforts seemed to try to show that all kinds of tissues could be produced, but such stuffs could not be generally looked on as articles of commerce. National pride was satisfied, but the manufacturers were not remunerated for their ingenuity and apparent disinterestedness, and they afterwards adopted more utilitarian views, in more precise accordance with their interests.

Recent commercial treaties between different European nations have established a sort of industrial equilibrium that regulates the nature and importance of the productions of each country; and now, instead of trying to carry on all industries in the same country, it is thought better to leave neighbors unmolested in the business in which they excel, and have no rivalry in trade.

In reference to silk, this new condition of affairs, not obstructing the production of certain articles for home consumption, seems to concentrate the fabrication of fancy silks in France; of velvet, in Prussia; of lighter stuffs, in Switzerland.

These results, which must have been foreseen by the commercial treaties, will injure those industries of each country that owed their prosperity to protection; but the surer consequence will be, to place the productions of each country within reach of all the others, and thus to create, by a sort of reciprocal dependence, a solidarity of interest, which will be a certain pledge of cordial relations and a continuation of prosperity.

RIBBONS.[1]

According to recent statistics, the ribbon industry amounts to two hundred and fifty millions of francs in all Europe. Out of this sum, France manufactures one hundred and fifteen millions' worth of ribbons, and then come England, Switzerland, Prussia and Austria. During prosperous years, this amount has been exceeded; but it has not been the case in late years.

In France the manufacture of ribbons of pure silk, or mixed, began, about the eleventh century, at Saint Chamond, whence it extended to Saint Étienne, where it is now carried on most extensively. When the bar loom was imported, and later the Jacquard machine was adopted, the business took a rapid start.

Saint Étienne was once famous for its manufactories of wooden ware, fire-arms and hardware; and when workmen were wanted to make the new looms and silk machinery, they were found ready on the spot.

Ribbon-weaving was found so profitable, that the capital amassed in other business in that part of the country was soon invested in it, and the ribbon manufacture increased tenfold. This beginning explains why labor at Saint Étienne is distributed among families, instead of being confined in factories, or monopolized by rich houses. This state

[1] Extract, translated, from the report by M. Girodon, of the International Jury, vol. IV.

of things will certainly change in time; but it cannot change so much as other kinds of manufactures, because of the peculiarity of the ribbon business.

Two kinds of ribbon are made here, the fancy ribbon and the common ribbon. The latter employs three-fourths of the labor, and supports a large portion of the population. Since large factories have been established elsewhere, the manufacturers of Saint Étienne have been obliged to exert themselves to keep up their merited reputation.

The fancy ribbon manufacture requires an infinity of designs that must be made by hand; for, machinery, perfect as it may be, cannot bend itself to all the variety of hand-weaving in ribbons. The variations and changes in these looms are effected by the weavers themselves, who must be workmen of skill and taste.

As the workmen are interested in the success of their machinery and its product, the work is always of a superior kind. Stimulated by personal interest, they are constantly improving their business, and perfecting the mode of operation: they all want to become inventors.

It is singular that no invention or improvement has been discovered by a professional mechanic or engineer; all the discoveries are due to operatives or workingmen. Hence the success of emulation, which is the prosperity of Saint Étienne. The most intelligent operatives see the possibility of rising; they see that one-third of the manufactories of Saint Étienne belong to men who were former overseers; and they know that most of the rich men began in the same way. In fact, it is very easy to become a manufacturer at Saint Étienne; it does not require a big house nor much capital. The looms and tools belong to the operatives; it only requires two or three looms to entitle a person to a license to begin business. The success of the beginner depends on his invention of some fancy article that will take. Expectation is often deceived; but the places of those who are dissappointed and leave are soon filled by newcomers, and the competition continues. This explains the reason why we see so many new names at every Exposition.

There are more than two hundred establishments at Saint Étienne engaged in the manufacture and sale of ribbons. For many years the business has reached near one hundred thousand francs per annum.

The saying of Colbert, that taste is the essence of trade, is particularly applicable to the ribbon business, and is especially exemplified at Saint Étienne. Division of labor is nowhere so well arranged as there.

Paris is the chief market for fancy ribbons; but they are sent to foreign countries from there, and get the name of French or Paris ribbons. But England and the United States buy their ribbons directly from Saint Étienne.

Previous to 1860 the ribbon manufacture took an unhealthy flight; but since that year it has subsided into reasonable limits. The American war and the silk-worm disease were the causes of depression in the business since 1860; and then the small hats for women and the substi-

tution of plain for fancy ribbons, and lace and fringes for both, did much harm to the ribbon industry.

Since 1862 the business has been stationary, and there seems to be a tendency to condense labor into large factories. By the invention of new machinery called *compensators*, Chinese silk is worked to advantage.

It is not only important for ribbons to be smooth, but they must be brilliant, and that brings dyers into important use. This branch of the business is reduced to a fine art at Saint Étienne. Besides furnishing coloring for material used at home, these artists dye for the Lyons manufacturers that used to send their silks to Saint Chamond. The twenty-nine steam-dyeing establishments at Saint Etienne give work to more than one thousand persons.

In 1812 a school of design was founded at Saint Étienne, and it has educated the skilled artists that have kept up the prosperity of the place. Independent of the different day-schools of design, decoration, and painting, there is now a night-school, where more than one hundred pupils assemble every night to learn arts that will be useful to them the next day.

In the department of the Loire, there are twenty-four thousand persons employed in the ribbon manufacture, not counting the operatives that work in large factories. The twenty-four exhibitors at the Exposition had every variety of ribbon; fancy, plain, fringed, velvet, laced, net, meshed for cravats, elastic, &c. Several houses make elastic tissues for drawers, garters, and other uses. The gum is brought from England, where it is prepared in large quantities, and its use is extending in France.

RIBBON MANUFACTURE IN COUNTRIES OTHER THAN FRANCE.

At the London Fair of 1862, Coventry, England, was represented by nine manufacturers of ribbons. Only three sent their samples from England to the exhibition of 1867. The specimens were ordinary, and seemed to be intended for commerce alone. There was no velvet ribbon among them. In 1862 there were elegant broad ribbons, with worked flowers, gothic letters, and other ornaments, neatly executed; but at the Exposition we have nothing of the kind. What became of them? The English seem to want initiative taste in artistic composition. They can copy French designs, but invent nothing; yet, the solidity of their fabrics commends them to certain buyers.

The factories at Coventry are increasing in importance, and the produce is all consumed at home.

The factories at Basle, Switzerland, are quite different from those of Saint Étienne. At the latter place, a small number of producers had democratized the business; at Basle, it is in the hands of wealthy manufacturers. There are only twenty-six manufacturers in that city, and sixteen exhibited at Paris. The collection was arranged with admirable taste, so as to catch the light in the most effective manner. The manufacturers there are more of merchants than artists, so they make plain

ribbons that find a ready sale anywhere. We are certain they made nothing expressly for the fair. There are between six and seven thousand looms at Basle, and they are all confined to well-made, low-priced, salable ribbons.

All varieties are collected in a single case. The principal style is the taffeta ribbon, of various breadths, and of every quality. There were plain and glazed ribbons, black and blue belts, and many other articles for which Basle is famed. The business at Basle is estimated at thirty or thirty-five millions. The city deserves credit for having kept up the business against such killing competition.

In 1834 Basle exported only ten millions in ribbons. The business has since increased three-fold, though the number of looms has not increased in the same proportion. The machinery has been greatly improved, and the work shows the advantage of perfect machinery in any business. With this increase of production, wages have remained stationary.

Basle ribbons find their way all over the world. The plainest and most substantial find a ready sale in England and America.

At former international fairs we were astonished at the sluggishness of the manufacturers on the banks of the Rhine in taking part in the industrial tournaments of the world; and we were still more astonished in 1867 to see only four Prussian exhibitors in the palace of the Champ de Mars. This seems the more strange, inasmuch as the prosperity of those ribbon factories is known to the whole world.

Besides five thousand looms for velvet ribbons, and many hundreds of hand looms for the same, there are more than ten thousand English looms used in Prussia for making colored velvet ribbons. Their sale is good at all times, and the business amounts to forty or forty-five millions.

In addition to these, there are about one thousand bar looms for plain ribbons, black and colored taffetas, and pure or mixed silk. Prussia also produces a large quantity of lacings, braids, and mixed gold cord. Since the last treaty of commerce, most of these articles are exported to the United States, England, and France.

Austria was represented at the Exposition by six ribbon manufacturers; but we are not to judge of Vienna by what we see at the Exposition; we must look into the past. It is plain that the work of the articles on exhibition is rude, and the designs are evidently from France.

The dress of Vienna ladies is remarkable for neatness and taste, and the men dress with elegance and care; these elegant habits certainly have an influence on the manufacture of ribbons in that country; but the manufacturers need boldness in design and innovating enterprise.

Austria does not export much in the way of ribbons; fancy ribbons are imported from France; taffetas and black velvet from Prussia; but these importations are diminishing daily, on account of improvement in the domestic manufacture.

There are supposed to be from one thousand eight hundred to two thousand ribbon looms at work in Vienna and in the neighborhood.

CHAPTER III.

THE INDUSTRY OF READY-MADE CLOTHING.

THE ARTISTIC EXCELLENCE OF WEARING APPAREL PRODUCED IN PARIS—STATISTICS OF THE MANUFACTURE IN FRANCE—READY-MADE CLOTHING FOR WOMEN—THE SEAMSTRESSES' ART IN PARIS—THE MANUFACTURE OF HATS FOR MEN AND WOMEN—CORK HATS—CENTERS OF THE HAT TRADE IN FRANCE, AND STATISTICS OF THE MANUFACTURE—BOOTS AND SHOES—MANUFACTURE OF CLOTHING IN THE UNITED STATES—HEAD-DRESSES FOR LADIES—ARTIFICIAL FLOWERS.

To no other general exhibition of industry could this feature of wearing apparel be so peculiarly suitable as to one held in the French metropolis, the fertile mother city of the world's fashions. The branches of trade centering in the general production of wearing apparel are among the most important specialties of Paris in an economical point of view. The aggregate value of their yearly products is estimated by the hundred of millions of francs; they furnish a large item of exportation for foreign commerce. As a general rule, her exhibitors easily surpassed all competitors from abroad; and where these last successfully sustained comparison, they oftenest only furnished a tribute to the taste and skill of French men and women who have emigrated to the workshops of foreign employers. This statement is especially applicable to all articles of female attire, from under garments to the patent eleganeies of skirt and corsage; from the neatest of foot-gear and gloves of proverbial fitness to the fanciful hat.

An attempt to explain the remote causes of this French superiority would be most instructive. It is of no modern date. It was practically admitted by our English ancestors, five centuries ago. King Edward, returning from French conquests, brought home conquering French fashions in his baggage train, which, subsequently, and more than once, stirred Chaucer's satiric humor. The subject is not an altogether trivial one, and justifies a passing indication of some of the more immediate and apparent causes of the admitted excellence of Parisian taste in the matter of dress; an excellence, it should be first observed, that is not confined to any one social class, and that is common to wearers and makers of apparel; who act and re-act on each other with mutual instruction, as do intelligent actors and audience. This taste seems innate, and innate it doubtless is, at least to the extent that any sense or faculty exercised from generation to generation becomes an hereditary aptitude. The numerous public galleries, the yearly exhibition of French painting and sculpture, the finer of the public monuments, and the shop windows in the streets, are so many free schools for the constant, unconscious education of the Parisian's sense of form and color. They are born appreciative, and become critical unawares. Besides these, and

more directly productive of practical results, there are special schools of design, with reference to its application to the useful arts, supported or encouraged by government aid and voluntary subscriptions, among which evening classes exert a conspicuous influence, gratuitous instruction being there given to artisans both in the theoretical principles of beauty and their practical application. The result is that the worker brings not only expert manipulation and a practiced eye, but some capacity of original design and independent judgment to the work in hand, and crowns its completion with that indescribable quality that gives the masterpiece its *cachet de distinction*. The French style of *artiste* applied to milliners and mantua-makers is hardly an abuse of language; their profession, if not strictly within the domain of fine art, borders close on its outskirts. Their chief and best encouragement, as must always be the case where art in any kind flourishes, is from an appreciating public; at the present epoch they have a high and generous patron in the person of the Empress. This gracious lady is not only a finished connoisseur and zealous amateur, ever ready to duly reward the ingenious devices of others, but on more than one occasion has contributed felicitous inventions of her own, originating modes whose imperial sway has ruled willing subjects in all the ball-rooms of the world.

Throughout the temperate zone the outbreak of new styles is a nearly simultaneous phenomenon. They are deliberated over and their publication is resolved on, in solemn secret conclave held by the heads of certain houses. To their correspondents in the principal foreign cities they forward drawings, illustrative colored plates, and specimen models, in advance of the season, so that they can be issued at the same opening day for example in New York and San Francisco. Besides its first value of rarity, which belongs to anything that requires so much power of invention, a bold and seasonable novelty promises very considerable pecuniary profit to its originator and first introducers.

READY-MADE CLOTHING.

Of wearing apparel for men the variety was not very remarkable. Each nation, for the most part, produces its own supply in this kind; and the competition is rather local than international. In the designs of stuffs, Paris held well its own, but for other qualities the London goods were preferable.

As the first of these cities maintains unquestioned the first rank for women's attire, so the second for men's, conscious of its right, would laugh at the falsity of a report denying its supremacy. Each, however, borrows something from the other—the French gaining rather the most by the exchange. For heavy garments especially, they of late years follow the English in shapes and names, omitting only a little of the original amplitude, adding only a little native grace of form. The two capitals supply the models, which are adopted in other countries, subject to the trifling modifications of local tastes and wants.

The principal exhibitors of ready-made clothing were French, Belgian, and Austrian. The contributions of the latter were noteworthy for their meritorious combination of form and finish with cheapness. Among the curiosities which, though not unknown in America, attracted much observation here, was a seamless coat. It was first molded while the material was in a pulpy state, and afterward pressed into a consistency that is said to be favorable to long wear. For army purposes, and where large quantities need to be furnished in the briefest time, the process may have its uses; but it is not sufficiently perfected as yet to be of any general advantage. Army clothing was mostly of a very indifferent quality. The defect was the more striking from contrast with snugly fitting brilliant uniforms, of which plentiful specimens were constantly to be seen at the Exhibition, worn by the military visitors of all nations and grades.

Under the head of costuming should be placed a good part of the childrens' dresses, multiform, many-colored, and "of most excellent fancy." Their bright tints and pretty quaintness of cut, not inappropriate to the fresh cheeks and mobile vivacity of youth, offered happy solutions of the grave problem how to distinguish the mother's attire from her daughter's.

In made-up clothing for both sexes, France, as in most other classes of the Exposition, was the principal exhibitor. The committee of admission in this class, for France, collected some very important statistics, a brief resumé of which may be interesting.

The trade in ready-made clothing, finding its central market in Paris, is quite extensive. The cheaper classes of articles are principally produced in the provinces. Several of the larger houses have their chief workshops in the departments of the north, Pas-de-Calais, Gironde, Gard, &c. Much of this work, which was formerly done by hand, is now done by sewing machines, to an extent which is truly astonishing, the greater part of the seams being sewed in this way. The cost of labor on clothing for men amounts to about one-fifth of the value of the goods. The workmen employed by the tailors are of two divisions, those who prepare and cut out work, and those who put it together. Five-sixths of the tailors work at home, the other sixth being employed in the tailors' work-rooms. There are about one-half as many women engaged in this trade in Paris as there are men. Working either by the day or the piece, the men earn from three to six francs[1] per day, though some expert hands gain from eight to ten francs per day. The women earn from two francs to three francs fifty centimes per day, and a few from five to six francs. The tailors generally do their own cutting out, but the dealers in ready-made goods employ cutters.

The exportation is generally done through the instrumentality of agents. There is great difficulty in estimating accurately the production of men's garments; but the tailors and clothiers of Paris do business to

[1] A franc is equal to nineteen and three-tenths cents in coin.

the amount of more than one hundred and fifty millions of francs per annum, the exports amounting to about one-tenth of the whole. Great progress has been made in the extent of the business since 1855. Many foreign governments look to French clothiers for the equipment of their troops, a branch of the business which has been very active.

THE TAILORS IN PARIS.[1]

At the end of the seventeenth century the journeyman tailor, boarded by his master, earned about fifty cents a month, equivalent to ten francs of our present money. At the end of the eighteenth century the journeyman working on his own account earned one franc seventy-five centimes a day. In 1825, under the restoration, he earned from two to three francs a day; in 1850, under the empire, from three to three and a half francs a day; and in 1867, from four to seven francs daily.

Such was the progress of wages for labor.

Next the sewing machine came to the assistance of the working classes, and it was truly a Godsend to them.

Since the adoption of the sewing machine in 1854, wages have increased at least thirty per cent. As it lessens manual labor, thus economizing physical force, and makes more in less time, it is undoubtedly a benefit to the workman. A man who is able to buy a machine gains from twenty to thirty per cent., and a woman, from thirty to forty per cent. on their wages.

The tailor has marked advantages over the workmen of other trades: if he is intelligent, active, and industrious, he can soon become master; if orderly and economical, he can get work by the piece; and then gradually acquire a profitable custom. We have numberless examples of this in the many tailors that have made a name and a fortune from small beginnings.

We will now proceed to give the advancement in this industry during the last twenty years. In 1827 there were but three hundred and twenty-two tailors in Paris, and only one of them exported his manufactures; and they were made to peddle, and gave no credit to French-made goods. At that period exportation was restricted, and goods of this kind were not generally sent abroad. We have nothing definite about their exportation till 1849. In that year, the export amounted to forty millions; in 1866 it was sixty millions. We have already mentioned that the cutters, or tailors proper, were injured by their indifference toward the makers and wholesale manufacturers. The result of the latter business, in 1849, was twenty-five millions; in 1866 it was one hundred and nine millions.

Two incidents have happened to aid tailors—commercial treaties have opened foreign commerce to them, and railways have brought foreign customers to them in Paris. These visitors have carried fashionable

[1] Extracts translated from the report of M. Auguste Dusatoy, Vol. IV of the Rapport du Jury International.

clothes away with them, giving a fixed reputation to Paris fashions and a good and permanent custom to Paris tailors.

In the statistical reports of 1860 we find six houses doing business to the amount of one million of francs; in 1866 we find six doing a business of twelve millions. In 1866 we find seventeen hundred licensed tailors doing a business of two hundred and five millions of francs. Their materials were wool, silk, linen, cotton, and fringe and buttons, at a cost of one hundred and seven millions. The labor cost 98 millions, making a total of two hundred and five millions, as stated.

We find in 1866 thirty-four thousand men and eight thousand women working at home or in shops. Dividing the earnings of their labor among them, we have four francs sixty-five centimes as the average for men, and two francs thirty centimes the average gains for women.

Thus we see a sensible increase of wages for working men and women in the last six years. But we must observe that out of this two hundred and five millions, nine millions were for military clothing.

The following is a substance of the observations made by Mr. R. Sinclair, tailor, published in the British Artisans' Reports.

"After my arrival at the Paris Exposition I saw a great display of cloths, with but little tailoring from any country exhibiting. * * * with a total want of military work, which is much to be regretted, as it is the most difficult part of our trade. * * * * * *

"English tailoring was from two London houses, and consisted of a few uniform tunics wretchedly made and no way fit to cross the Channel, and a few garments, anything but well made for a West End firm, mostly for sporting purposes.

"In the French department, the tailoring was larger than in the English, without style or workmanship to recommend it, and cloth to match, supplied by slop and export houses.

"Both in France and England the slop-worker is in a wretched condition, who supplies this export work, and yet the profits accruing to these houses are enormous.

"The Austrian tailoring sent to the Exhibition was by far the best, and certainly was the best I ever saw (civilian work) for style, cut, and workmanship, and taste displayed to give effect; it could not be surpassed by any firm in Europe. This work was sent by J. Rothberger, Vienna.

"In the American department, there were a few garments badly made, army and navy clothing, chiefly made by machine, and I expect they were only sent to show the uniforms of the United States.

"The French tailors in Paris are more than outnumbered by foreign workmen, including Germans, who are very numerous; Alsatians, whom the French class as foreigners; Italians; a few Spanish; Belgians, called Flamands in Paris; Dutch; Swiss; with a goodly sprinkling of Russians, Swedes, Danes, and Norwegians. But the French workman in Paris is a better workman than the larger bulk of this stock of foreigners,

most of the latter being young and residing in France for two objects, to learn the language and improve themselves in workmanship." * *

CLERICAL ROBES.

There was nothing in all this Exhibition more complicated, and rich, and gorgeous with embroidery and colors and barbaric gold, than the clerical raiment. The old Gaul of ten centuries ago had two principal articles of clothing. One of them, as it grew longer under Italian culture, took the longer and more mentionable name of pantaloon. The other was a species of shirt, and named *casula*, the diminutive of *casa*, a house; it was his cottage, cot, or coat. This same *casula* is, almost without change, the modern French workman's blouse; and from it came also the magnificent *chasubles*. The manufacture of official church garments is a special and considerable business; but beside the offerings of professional fabricants, some of the most elaborate, and, in their kind, beautiful specimens of ecclesiastical apparel on exhibition, were the painstaking works of love, wrought by the hands of devout women.

READY-MADE CLOTHING FOR WOMEN.

The trade in ready-made clothing in France is chiefly confined to the "*magasins de nouveautés*," or dry-goods shops, where ladies' ready-made clothing is a staple portion of the stock. This is, of course, generally somewhat cheaper than that made to order and less elaborate in workmanship, but often rivals the latter for quality of material and elegance of forms. The most striking display of ladies' goods in the Exhibition was of this second class, and formed an exception to the general rule, being remarkable for thoroughness and finish of make. We refer to the dresses exhibited by Enout & Co., who, in their most charming patterns, were honored with the co-operation of the Empress Eugenie. An embroidered trimming in pansies deserves particular mention for its beautiful effects of harmony or of brilliancy, according as it was applied to a taffetas silk of a color corresponding or contrasting with the leading tint of the flowers. The most noticeable characteristics of the singularly rich and varied show of ball-dresses were the beauty of the patterns, which were mainly floral, lightness of tissues, and fullness of drapery. Even in their stillness they suggested floating, mazy motion. The finest two in their kind, whose "loveliness" excited the ejaculatory enthusiasm of female spectators, came from the workshop, one might almost term it studio, of Opiger Gagelin. It is one of the most famous in Paris, and its graduates may be found in all quarters of the city. Its importance may be guessed from the fact that it turns out no fewer than four hundred model dresses annually that serve as the studies from which nearly all the periodical fashion-plates are prepared.

The Compagnie Lyonnaise and the vast Magasin du Louvre both made

large displays; the first remarkable for extremely luxurious articles and costly fabrics; the latter, for its complete assortment of ornamental articles of female attire. Three magnificently embroidered mantles in the cases of the last-named house drew great attention, rather, however, as curiosities of ingenious and painstaking labor, than for originality or beauty of design. Equally elaborate and more eccentric was a white-satin dress, exposed by M. Bouillett, embroidered *en chenille*, with immense peacock feathers, most exactly rendering the natural colors and form and texture to the eye; a grand spreading imperial robe worthy of a Juno for its wearer. An opera-cloak in the same case was composed of swan's down covered with butterfly wings.

The probabilities are that these eccentricities of manufacture, if they ever come to human wear, will be borne on foreign, or, at least, provincial shoulders. With the Parisian the toilette is a composition in which not only the material, shape, and tint of each item of apparel, but the figure, features, and complexion of the individual are to be combined in subordination to that admirable whole, a well-dressed woman. She gives her mind to it. She devoutly holds to that dogma laid down by a serious preceptive writer on the subject: "*Une toilette est toute une science;*" and to that other maxim pleasantly amended and pieced out from Buffon: "*Le style, c'est l'homme et surtout la femme.*" Her apparel bespeaks herself; it is the "make-up" of her person. She dresses in character.

For the manufacture of ladies' clothing Paris is the greatest center, and in it is consumed an immense quantity of material of every grade of quality and price from the most ordinary printed cottons to velvet of the highest cost. For articles of summer wear the light fabrics of Roubaix, Elbeuf, Sedan, and Rheims, French merinoes and Scotch cashmeres, are principally used. For the trimming of ladies' clothing pillow and machine-made lace, also that of Paris and St. Étienne, and guipures and gimps from Lyons, are employed. The stuffs, cut or uncut, are given to dressmakers, or ladies' tailors, who employ from four to forty workwomen, besides those who work at home. The articles are generally sewn together by hand, the trimmings being added by the use of sewing machines. Outer clothing for the use of females is made almost entirely by women, and the sewing machines are generally operated by women. The average earnings of men at this trade are five francs a day; of women, about half that rate. A very considerable portion of female wearing apparel is exported, principally to England, Russia, Holland, Belgium, Spain, Italy, Turkey, North and South America, and Australia. The articles chiefly exported are paletots, talmas, pelisses, mantelets, embroidered shawls, scarfs, and jackets. Dresses, hoods, and children's clothing also enter into the export trade. These articles are furnished to the small provincial linen-drapers and commission merchants, while the principal linen-drapers in Paris and the provinces generally buy the patterns and have the articles made up

for themselves. The value of these articles produced annually in all France is estimated at one hundred millions of francs, or nearly twenty millions of dollars in our coin. Five-sixths of the whole are used in France, the exports being only one-sixth.

THE SEAMSTRESSES' ART IN PARIS.[1]

In estimating the progress of the seamstresses' art by their number at different periods, it has not advanced like some other industries. Thus, in 1780, the independent seamstresses numbered two thousand; in 1849, they were two thousand five hundred; and in 1867, only four thousand. We do not think their number has sensibly increased since 1860, but the business, then estimated at nineteen millions of francs, has more than doubled. The fourteen thousand sewing girls employed by the four thousand mistresses, with a business of forty millions, earn from two and one-half to three francs a day.

The trade in ready-made clothing for women did not actually begin till 1845. Before that time a few houses made crispins, spencers, and mantelets; but as they were sold at retail by a few fancy stores, or were sent abroad or into the country as models, they did not constitute a branch of commerce. Since our commercial treaties have opened the world to us, the industry has continued to increase until it has become an important branch of our commerce.

Articles of women's dress were once excluded from exhibition; but, in 1867, the industry was elegantly represented at the Exposition. We judge of this by the number of distinguished persons that crowded round the show-cases, by the considerable business produced by the models exposed, and by the approbation of knowing persons, that declared no country would compete with France in the line of women's garments.

As no other nation exhibited samples of women's clothing, we must confine our judgment to the French articles, regretting, however, that we have no foreign samples for sake of comparison.

After 1846, many establishments for the special manufacture of women's clothing were instituted; one of them does business to the amount of three millions of francs annually, and several others manufacture more than one million's worth per annum. Besides these many fancy stores have special departments for the sale of women's garments, and do a very good business in that line.

Many ready-made dresses are sent abroad as *samples* to all parts of the world to avoid the prohibitory tariff on ready-made clothing, which exists in many countries; in Spain, for example. In Portugal our ready-made clothing has to pay a duty of eighty per cent.; and in many other countries a duty of fifty or seventy-five per cent.

If the government would revise our commercial treaties and open foreign countries to our fabrics, the business in Paris would take a new

[1] Extract translated from the report of M. Dusatoy, of the International Jury, Vol. IV of the Jury Reports.

flight upwards. The business of women's clothing amounted to fifty-five millions of francs in 1867; the pay was twenty-five or thirty per cent., and the number of seamstresses employed was about seventeen thousand.

In the general statistics of the Paris Chamber of Commerce for 1860 this business was estimated at twenty-seven millions seven hundred and sixty-five thousand, and we may justly reckon it at double for the year 1867; this, added to the forty millions done by seamstresses, will make the entire business amount to ninety-five millions of francs per year.

We cannot estimate the quantity of material used by dressmakers, its fineness and value; because the variety of stuffs is so great, and they change the fashion so often, certainly the quantity used cannot be reckoned with justness.

Every industry that is controlled by fashion is so changeable that the material used in it escapes all analysis, and cannot be correctly estimated.

We think we have shown that we were right in affirming that the clothing industry is the most extensive industry in the world. In fact, is there a single business that can compare with the figures we have given, and which employs seventy-five thousand working men and women, one-twentieth of the population of Paris, at salaries amounting to more than eighty millions in the aggregate? If the question be studied in a family point of view, with humanitarian and moral considerations, the consequences and benefits of the industry are incalculable. The married woman finds a remunerative labor in making clothes, a labor she can carry on at home, and which helps the housekeeping; the young girl can work at home, in the business, or in a shop with other girls, at good wages, and is not obliged to work in large manufactories, where crowds of men and women, old and young, often produce lamentable and immoral consequences.

If the question be examined in an economical light, from an industrial point of view, we are instantly struck with the immense quantity of material used in the business, which in Paris alone amounts to one hundred and fifty millions, forty millions of which are sent abroad.

But for this business, which makes the fashions of Paris known all over the world, our material, not better than that of other nations, would not have such extensive consumption. The clothes-making business, in fact, is the main support of our manufacture of tissues, and is certainly the principal cause of the prosperity of our grand industrial establishments.

These consequences are due to the causes we have enumerated, as well as to the men who have taken such a large part in the manufacture of articles of clothing for both sexes. If we take as a basis the forty millions of tissues exported by clothing establishments, and the labor required to work up the raw material, we must give credit to the clothing business for much of our prosperity.

HATS FOR MEN AND WOMEN.

The word hat, according to etymology and the standard dictionaries, signifies "a covering for the head *made of various materials and worn by* men or *women*, for defending the head from rain or heat, or *for ornament*." We have italicised the only part—and in proportion to the subject it is a large one—of the definition applicable to the articles that were exposed under the title of hats for women. There was a large collection of them, marvellous for diversity of material and form and devices of littleness—capricious snips of things "pricked in with the humor of forty fancies." They had their fantastic charm withal, though nothing about them was so astonishing to a mere man's mind, seeing their diminutiveness and apparent frailty, as to learn what heavy prices they bore. Some were made of ivory and pearl, others of leather. There were some composed entirely of feathers, others of paper, yet other fragilities of glass.

In the manufacture of hats for men Paris excels London for lightness, but not durability. Cork enters largely into the composition of the finest qualities, securing both lightness and imperviousness to rain. Much ingenious machinery is used for preparing the cork and cutting it into the thinnest of leaves. In the Italian section was a cork hat made up of two thousand one hundred pieces. Felt hats, of which there is a large manufacture in France mainly for exportation, were exposed in profusion. They are made by molding and pressure in the same manner as the seamless coat spoken of above. The whole process was seen in operation in the machinery department, where the raw material was transformed in a few minutes to the finished hat. In the same department, boot and shoe making machinery from Alexandria was working rapidly and well. There were several varieties of straw hats from South America; very cheap and serviceable articles in like kind, such as are commonly worn by sailors and fishermen from Malta; others made of the fibre of a plant, very strong and impervious to sun, wind, and rain, from the Cape of Good Hope. Besides felts, Italy sent some exceedingly fine specimens of straw from Leghorn and other places; and England presented a handsome show of chip hats.

The most picturesque caps, embroidered with gold, were from the Eastern countries. Austria excelled in red cloth tasselled caps. The plainest came from England, the cheapest and most serviceable from Hungary.

MANUFACTURE OF HATS FOR MEN.

The centers of the hat trade in France are Paris, Marseilles, Lyons, Aix, Toulouse, Bordeaux, and some other southern towns. The materials most used in the manufacture are the skins of the beaver and muskrat, imported from Canada, that of the Goudin rat, from South America, hare and rabbit fur, and various kinds of wool. There are two

distinct divisions of the manufacture, namely: that of the soft and firm felt hats, and that of silk hats. Workmen, whose special business it is to cut the hair from the skins, furnish the makers with their raw materials. The manufacture of French hats consists of several distinct processes. The fur is first beaten either by hand or machine. A felt bag twice the size of the hat is thus produced, which is then filled by hand or by a machine constructed specially for this purpose. The hat is now scraped with a knife, to take off the long hairs, rubbed with pumice stone, and stiffened, or not, as the case may require. Next come the processes of dyeing, blocking into form, binding, and the insertion of the head lining and leather.

A different system prevails for silk hats. First the form is made of the fabric preferred, stiffened with gum shellac. A kind of silk plush is made to adhere to the exterior of this form, and within is inserted material suited for a lining. Many silk hats are made with the adhesive linings, in which case the interior surface becomes part of the solid shell.

The skilled workmen command high wages, comparatively getting as high as ten francs per day. The average, however, is between forty and fifty francs a week. The work is done by the piece, under the supervision of foremen chosen from among the best workmen. The latter earn from two thousand to three thousand francs per year. Women in this trade are paid from eighteen to twenty francs per week. Most of the operatives work in the factories. French hats are exported to nearly all parts of the world, and sold from three or four francs to twenty-five or thirty. Opera hats, made with compressible spring sides, are exported in considerable quantities. The manufacture amounts to about five millions of dollars estimating on the gold basis, the exports being about twelve million francs. Great improvements in hat-making machinery are constantly coming into use. Pretty much the same materials continue to be used, but the wages of workmen have increased. The great manufacturers now make and finish completely their goods, and practically the hatter whose name is in the crown is only an agent between the producer and consumer.

Twenty millions of francs' worth of caps are also made per year in France, the sewing and embroidery being in a great measure done by machinery; not many of these are exported. The *kepi*, which has since 1848 been introduced into the army, the public schools, and administrations, constitutes quite a proportion of the manufacture, and a considerable number of Greek or Fez caps are made, either knit or felted; the principal places for the manufacture of these being Paris, Orléans, Rueil, Condom, and Chalons, and many of them are exported.

BOOTS AND SHOES.

Boots and shoes were exhibited in great abundance by many nations. Among them a case in the American section, from Burt & Co., of New

York, bore favorable comparison with the best of foreign make. The present style of French boots is, like Achilles, open to attack in the heel, which is too high and brought so far forward as to change the natural point of support, throw the weight of the body too heavily on the toes and unsteady the pose. It makes the foot look smaller from the front, and pitches the body slightly forward.

THE BOOT AND SHOE MANUFACTURE IN FRANCE.

Many ingenious improvements in machinery for this manufacture have been made. The business is divisible into three classes—sewed boots and shoes, those pegged or nailed, and those fastened by screws. Most of the French sewed boots and shoes are made in Paris, Nantes, Marseilles, Bordeaux, and Fougères; pegged ones in Paris, Liancourt, Romans, Blois, and Angers; those made with screws are only produced in Paris. Most of the findings and trimmings of boots and shoes of the French manufacture are made in France. The workmen are divided into three classes, the foremen, receivers, and cutters. Half of the operatives are women, who receive about half the rate of wages paid to the men, the men being paid about four francs per day. The ready-made trade is carried on by commercial travelers who sell to the provincial dealers. Commission merchants buy for exportation. The average price of good boots and shoes is sixteen francs for those worn by men, eight francs for women's, and six francs for children's. The more common sorts for men are sold on an average at eight francs, those for women at five francs, and those for children at three francs a pair. These productions of the French trade are exported principally to North and South America, East and West Indies, England, Italy, &c. Paris alone produces boots and shoes to an amount of one hundred million francs; the provinces also contribute largely to this trade, and about forty million francs worth are exported. Since 1855, the use of sewing machines for sewing together the upper leathers has become very general.

MANUFACTURE OF CLOTHING IN THE UNITED STATES.

In the earlier days of this republic most of the clothing used, except among persons of wealth, was of household or strictly domestic origin. Great simplicity of dress was a requirement of the austere ideas of propriety prevailing in those days, and the colonial codes, many of them, contain statutory restrictions on the subject, the violations of which were punished by penalties of various degrees of severity.

The first fulling mill in America was erected about the year 1643 at Rowley, in Massachusetts; yet, in the year 1713 it is recorded that there was but one clothier in Connecticut, who could do little more than full a portion of the homespun made, much of which was worn unshorn and undressed.

The wealthier classes in the colonial period imported much of their clothing material and all of the finer cloths from England. In the larger

cities and towns, however, tailoring establishments found ample patronage.

The tailors were sufficiently numerous and important in Philadelphia in 1718 to apply to the city government for an act of incorporation. A Master Tailors' Society was incorporated in that city in 1805.

The branch of ready-made clothing business commenced in 1825, and was started chiefly to supply a demand for ready-made clothing in the southern States and certain foreign countries. The production of clothing by the wholesale, with the aid of labor-saving processes, naturally made a great reduction in the prices of this class of wearing apparel, and its use has become very general among persons of moderate incomes. Our import duty on ready-made clothing has ranged as follows: from 1816 to 1828, (inclusive,) thirty per cent. ad valorem; from 1828 to 1846, fifty per cent.; 1846 to 1857, thirty per cent.; 1857 to 1862, twenty-four per cent.; since that time, thirty-five per cent.

The average annual value of ready-made clothing imported into the United States from Great Britain in 1827 and 1828 was about $803,000. For the next six years it fell to an average of $498,000; for the ten years ending 1844, the average was about $808,000; for the years 1851 and 1852, $97,032. Our exports of clothing for 1827 and 1828 averaged $119,510; for the next five years $75,576; and for the ten years from 1833 to 1843, the annual average was $118,730. In 1851 and 1852 the average annual exports reached the value of $250,102.

Four cities manufactured more than one-half of the whole quantity produced in the United States, namely: New York, $17,011,370; Philadelphia, $9,984,497; Cincinnati, $6,381,190; and Boston, $4,567,749.

An extensive and important change has taken place of late years in the dry-goods trade, through the extension of the ready-made clothing business, which has thrown the importation and sale of foreign and domestic cloths to a great degree into the hands of wholesale clothing merchants, and thus the jobbing business is united with that of manufacturers and dealers in clothing on a large scale. These branches, in consequence of the high cost of materials, the long credits given, and other circumstances, require heavy investments of capital and a high degree of discrimination and judgment in the selection of goods. Some of the establishments are so extensive as to require several thousand persons to perform the various duties pertaining to the manufacture and sale of clothing. The male hands have been principally German and Irish immigrants, the cutters being principally American, and they have uniformly received higher wages than the same classes could earn in Europe. The sewing machine has been extensively used in this business for several years, and has given a vast impetus to the trade. It has done this by cheapening the expense of production, as well as by enabling the manufacturer to turn out his work at the shortest notice, and thus keep pace with the changes of fashion in regard to the cut of the clothing and the style of material. In fact, it was mainly the result

of the introduction of the sewing machine that the many small shops have been to a great extent superseded by the large wholesale establishments. This change is most forcibly illustrated by the fact that, from 1850 to 1860, the number of establishments was reduced eleven per cent. and the number of hands increased two and four-tenths per cent. only, yet the capital invested in the business increased nearly one hundred per cent., and the aggregate value of the product five and one half per cent.

HEAD-DRESSES FOR LADIES.

The head-dress is among the most conspicuous of the articles which determine the style or fashionable character of a lady's appearance; and it is in Paris, chiefly, that the novelties of this department are originated. The materials used in the manufacture of bonnets and caps, such as buckram, whalebone, wire, various stuffs, flowers and lace, are obtained from special manufacturers. There is no fixed method of preparing articles of millinery. It is altogether a matter of taste and ingenuity. The workmanship forms only a small item in the value. The average of wages of working milliners is two and a half francs per diem. Nearly all the milliners sell direct to the purchaser. Some firms, however, make up articles specially for exportation, and these alone employ under-milliners, who receive the necessary materials for a certain number of bonnets and head-dresses, and prepare the work by arranging and fastening the various stuffs upon the ready-made shapes which they furnish. The ribbons and flowers are always added by the milliner herself. It is difficult to estimate the exact value of millinery annually produced in France; but it must be considerable, as the Parisian milliners' returns amount to nearly twenty millions of francs, or nearly four million dollars in gold. About one-tenth of this is exported, chiefly to America, England, Spain, Belgium, Holland, Germany, Prussia, and to the French and English colonies.

ARTIFICIAL FLOWERS.

The annual French—chiefly Parisian—production of artificial flowers, of which about three-fourths are exported, amounts in value to eighteen million francs. The display of them, in what may be styled the ladies' department of the Exhibition, was one of its most attractive features. The fidelity to nature of these counterfeit presentments—in leaf, and blossom, and pistil, in exquisite fineness of line, and tenderest shade in gradation of color, to the very dew glistening on the petals—is so deceptive that it is only by an appeal from the eye to the sense of smell that nature can sustain her prior claim. The counterfeit representatives of every clime in this international floral display vied in hue and form with their living originals in the park and horticultural annex. For certain purposes of ornamentation they are, indeed, superior to the growth of the garden. They do not droop and fade as the gaiety of the ball room

rises, nor by their perfume weigh the heated atmosphere with an additional sickly element.

The production of artificial flowers may be named among the artistic specialties of Paris, in which she stands without a rival. The materials which it consumes are various and delicate; for the leaves and blossoms, jaconet, nansook, cambric, muslin, velvet, crape, satin, silk, French cambric, feathers, paper, and wax are made use of; and for the stems, berries, and fruits, wire, silk, cotton, floss-silk, paper, starch, gum, gelatine, wax, paste, chenille, quills, whalebone, gauze, chopped wool, and glass balls. For mounting the flowers, silk, paper, gauze, and iron and brass are required. The workmen always use the same instruments, goffering irons, stamps, &c. The galvanoplastic process is sometimes employed. The cost of workmanship amounts to about four-tenths of the value of the productions, and the materials employed to about three-tenths. The remaining three-tenths represent the profit of the producer. This manufacture is divided into a great many different branches. For the preparation of the colors there are special workshops. The work is generally carried on at the homes of the work-people. This trade employs fifteen thousand persons, nine-tenths being women and girls. The men earn about four francs a day, the women two francs twenty-five centimes. The mounting and sale of flowers is carried on for the most part in handsome shops and show-rooms, where all kinds of flowers are generally sold as well as the different sorts of ornamental feathers. Three-fourths of the entire manufacture are exported through the medium of commission agents. The value of the trade is about fifteen million francs per annum. The flowers are exported to America, England, Belgium, Russia, and Germany.

CHAPTER IV.

LACES, FANS, GLOVES, ETC.

THE MANUFACTURE OF RARE AND COSTLY LACE BY HAND—NOTICES OF SPECIALLY INTERESTING EXHIBITIONS OF LACE—MACHINE-MADE LACES—WAGES, CONDITIONS, AND DIVISIONS OF LABOR—EDUCATION OF LACE-MAKERS—THE BRITISH ARTISANS UPON LACE—MANUFACTURE OF LACE IN VARIOUS COUNTRIES—EMBROIDERY—MANUFACTURE OF FANS—MANUFACTURE OF GLOVES IN FRANCE, ENGLAND, AND OTHER COUNTRIES—ELASTIC TISSUES, SUSPENDERS, BELTS, GARTERS, AND BRACELETS.

THE PRINCIPAL DISPLAYS OF LACE.

The manufacture of lace of the most rare and costly descriptions is performed by hand labor, the designs being furnished by artists who possess a high degree of skill—the result of long-continued studies and practice under circumstances most favorable to the attainment of proficiency in the specialty of producing designs adapted to this manufacture.

The point laces of Alençon and that of Brussels are so intricate and the manipulations so delicate and difficult that it is necessary to give a life-long training to the operators to secure excellency in each distinct characteristic of fabrication.

The art of lace-making has been carried to such perfection that a sufficient indication of light and shade can be introduced to give an approximation even in such transparent tissues as the Brussels and the Alençon point to the relief effects attained in engraving.

The specimens of Alençon point and other French lace at the Exposition were carefully selected and very beautiful in design and workmanship. The black lace of Bayeux and Calvados is the most important and extensively manufactured in France.

One of the leading firms in the production of this lace is Messrs. Lefébure, who exhibited a dress of point d'Alençon, combining the highest qualities of the art, the price of which was $16,456 in gold. This dress, consisting of two flounces and trimmings, took the labor of forty women for two years to produce it. The same firm had also a superb point or half-shawl of black lace; the design consisted of a large central bouquet of roses perfectly shaded and standing out as it were from the ground. This central cluster was surrounded by a border of roses, upon which equal skill was displayed. The price was a trifle less than two thousand dollars in gold.

Another example by the same exhibitors was a bridal veil, the ground of which was needle point, the flowers application made at Ghent, and the border in the style of Venice point, while figures in point d'Alençon formed part of this rich and harmonious composite. The lace of Malines or Mechlin lace, as well as the ancient rose or Venice point in high relief, were shown by the same house.

Among the many admirable specimens of black Bayeux laces were the following, by Messrs. Verdé-Delisle: a point ornamented with beautifully shaded flower forms, a parasol of finest quality, and a flounce of ferns and flowers, and a dress pattern. They also displayed a flounce of point d'Alençon, style of Louis XV, the flowers in medallions; a dress of Brussels mixed points, and some specimens of Cluny guipure, and some altar cloths. Messrs. Lefébure and Messrs. Verdé-Delisle enjoy an enviable distinction for superiority in the design and quality of their fabrics.

Among the other notable specimens in the French section were a very elegant tunic of white lace made partly in Brussels and partly at Mirecourt; a black lace flounce of exquisite fineness of texture, a black lace parasol, a Bayeux flounce in roses, handkerchiefs bordered with Venice point and filet from the Convent of Notre Dame du Puy, black silk guipure shawls and laces printed in colors or embroidered with pearls, from Auvergne.

The Belgian section, too, presented an exhibition of laces hardly inferior to those of similar grades in the French; the Dromment varieties being Brussels, point à l'aiguille, plat, application, Grammont and Mechlin. A dress of "point gaze" exhibited by Hooriekx was valued at $10,000.

The principal manufacture of lace in Belgium is that of the Valenciennes variety. It is made throughout East and West Flanders, the finest qualities being Ypres, West Flanders. Grammont, West Flanders, is the seat of an extensive manufacture of black lace in which considerable improvements have been made.

There was a creditable display of shawls of this lace by the collective exhibitors of Grammont. These are not so carefully worked, however, as the Bayeux laces of the same class.

Prussia and the German states exhibited only some needle point flounces of Berlin edgings from Nurtingen. Austria, a point imperial and the coarser laces of Bohemia. Spain, the lace of Barcelona. Sweden, the torchon lace of the peasantry. Russia, that of Helsingfors. Italy, the black and white pillow-made laces of Genoa and imitations of French laces. Rome, a remarkable specimen of old Venetian point. Turkey, white silk crochet lace from Smyrna and the Island of Rhodes. Malta, her traditional black and white guipures. England, Devonshire lace, Honiton, Cluny, and needle-made laces. Ireland, guipure. Central and South America are represented to a very limited extent in laces characteristic of Paraguay, Uruguay, Chili, Venezuela and Brazil.

NET AND MACHINE LACE.

Imitations of some of the standard laces have been successfully made by machinery of ingenious construction, chiefly at Calais and Amiens in France, and Nottingham in England. The French produce in this way imitations of Valenciennes, Cluny, colored laces, white and black blondes, especially excelling in white blondes, which are to a great degree taking the place of the hand-made lace of the same type.

Amiens produces the finest llama and yak shawls. Plain and embroidered silk tulles are made chiefly at Lyons.

Brussels net made by machinery now used as a ground for laces has superseded the pillow-made ground, at an immense saving of labor and expense and giving equally satisfactory and artistic results.

WAGES, CONDITIONS, AND DIVISIONS OF LABOR.

There are in Calais and St. Pierre seven hundred and eighty machines, the best of which were built in Nottingham and its vicinity. They are all in factories worked by steam-power, running all hours, commencing work from six to seven o'clock on Monday morning, continuing until ten o'clock on Saturday evening; in some establishments working up to ten and twelve o'clock on Sunday morning.

A great deal of liberty is allowed the workmen for social intercourse, and a large amount of affability and familiarity exists between employers and employed in the various workshops.

There are two men at each machine taking alternate shifts or turns in working, one commencing on Monday, from 6 to 7 a. m., continuing until 9 a. m., and the other coming on at 9 a. m., and working until 1 p. m., the first coming back at 1 p. m., remaining until 6 p. m. The one leaving off at 1 p. m. returns at 6 p. m. and works until 2 a. m., and so on through the week.

The law in France is that a week's notice shall be given and taken by the employed; the man, if these conditions have been fairly complied with, receiving what is termed his *livret*, in which is described his personal appearance, answering the purpose of a passport to any part of France. If the employer refuse to give the *livret* he is liable to a fine of fifty francs. If the workman leaves in debt it is inserted in his *livret*, and his next employer, according to law, can stop one-fourth of his earnings for the purpose of refunding the debt to his former master.

In the lace trade terms are used to denote the width of machines, such as "quarters;" any number of inches a machine is in width upon being divided by nine inches (a quarter of a yard,) gives the number of quarters. "Gauges" are counted by the number of points or combs contained in an inch. All gauges are calculated from the ten-point standard.

The workmen are paid by the "rack," consisting of one thousand nine hundred and twenty motions of the machine.

EDUCATION OF LACE-MAKERS.

As a means of artistic education, the perfect freedom of access to the picture galleries appears to be taken great advantage of, and fully appreciated by the people; as upon our visit to the Louvre, in one gallery alone, we witnessed fifteen persons, old and young of both sexes, copying the paintings of the great masters. The beautiful gardens are another source of attraction and instruction to the people. The intimate and

social freedom we noticed existing between the employer and employed, is another source of great improvement to the work-people.

THE BRITISH ARTISANS UPON LACE.

In the reports by the British artisans there is one upon lace by Edward Smith, Joseph Bird, and George Dexter, delegates recommended by the Nottingham Chamber of Commerce, from which the following is extracted:

"Believing in its importance," (the lace manufacture,) "we have endeavored to the best of our ability to ascertain the quality of work turned out by different nations; influences affecting the character of the work and trade generally, such as cost of material, wages, conditions and divisions of labor, education, habits of life, amusement, and trade associations.

"The first class of goods we inspected was the French department, Group IV, Class 33.

"The hand-made laces are of surpassing beauty; the intricacy of and perfect following out of the leaves and flowers of various plants introduced into the designs are very delicate and truthful. We are of opinion that the carrying out of the design in the hand-made lace must have an abiding and elevating power upon the minds of the females engaged in this branch of industry, implanting a taste for the beautiful that no doubt descends to their children, widening and spreading in its character and influencing all who may come in contact with them.

"The total number of lace makers is estimated at two hundred thousand women and girls. They gain on an average one franc twenty-five centimes per day; some who are particularly skillful and industrious earn as much as three francs fifty centimes for ten hours' hard work. Lace-makers are for the most part peasant women, who all, without exception, work at their own homes, often quitting their lace pillows and babes to attend to household duties or to work in the fields; lace-making has the advantage of being carried on at home, and, therefore, of not depriving agriculture of too many able hands. French lace is sold in all markets—in the United States, the Brazils, Russia, Germany, Italy, Great Britain, the East and the West Indies. Paris is the principal center of consumption, the young females wearing a very tasteful description of head-dress composed of all kinds of lace.

"The machine-made laces are of a very high character both as regards quality of material and design. It is impossible to carry out the design to perfection unless a sufficient number of motions of the machine is gone through so as to give an opportunity for the figuring threads to lay in the work in that smooth and rounded form, successfully tracing the design upon the lace as upon paper. This is pre-eminently the feature of the French machine-made laces. All the articles from the broadest to the narrowest widths exhibit the same beauty of construction. The laces exhibited consist principally of blondes, black laces, edgings, guipures,

and Clunys. The blondes have a bright silvery appearance; the black laces, in the form of shawls, flounces, &c., display great beauty of design and brightness in the thick-thread silks, not only in the goods exhibited, but those we saw in the course of manufacture at Calais and St. Pierre near Calais.

"A first-class article would appear to be the ruling feature in the minds of the manufacturers, the design in no way being sacrificed for the sake of cheapness."

MANUFACTURE OF LACE IN VARIOUS COUNTRIES.[1]

The generic term lace comprises all those fine thread works made by spindle or needle.

Spindle lace is made in a simple portable frame, in the operative's lap, with spindles and thread, and pins to guide the thread or point out the design. There has been no recent change in this frame or loom, nor in the method of lace-making; the same process has been followed for four hundred years. Spindle lace is made of any textile fiber; flax, cotton, silk, wool, hair, and even gold and silver wire are used in its fabrication, producing the common *picot*, at five centimes a yard, or the sumptuous lace that sells like precious stones. Needle lace, generally termed point lace, is made with a common needle, after a pattern held in the hand; and white thread is the usual material for it.

The manufacture of lace is very varied; so much so that we might say there were as many varieties as factories. Lace is made in every part of the world, and no two kinds are alike, though the mode of making be similar; and for that reason laces generally take their names from the places where they are made. It is said the business of lace-making in Europe gives employment to more than half a million women and girls; they all work at home and earn ten or fifteen centimes an hour.

All the large lace manufactories were represented at the Exposition. We will only notice some of the principal ones in Europe. France and Belgium are the great lace-making countries, and give work to four-fifths of the females employed in that peculiarly feminine industry.

SPAIN AND PORTUGAL.

Spain was once renowned for its blonde silk lace; the prosperity of the business has been declining for many years, and now it is almost extinct. The lace made there now is for robes, mantillas, veils, and garments used at home or in the American colonies. Barcelona is the central lace market of Spain. The operatives of Catalonia are not wanting in skill; and they often excel in this delicate work. With proper encouragement they might supply the world, at a reasonable price.

The production of Portugal and Madeira is less important than that of

[1] Extracts translated from the report of M. Felix Aubry, Class 33, Vol. IV, Jury Reports.

Spain; and it is confined chiefly to narrow lace for trimming. The work of the Portuguese operatives is good, solid, and cheap; but the designs are old and are wanting in taste; with proper direction they could make as good lace as is found in Puy, and might rival that part of our country in its production.

GERMANY.

Spindle lace, which is made all over Germany, even in Denmark and Bohemia, is known in commerce as *Saxon* lace. The principal centers of its production are Annaberg, Dresden, Eibenstock, Carlsbad, and Tondern. The different kinds of German lace are generally common looking and of inferior quality; the designs are old and ugly, unless copied from French designs; and the workmanship is far inferior to any of ours, in fact, is not as good as that of Auvergne. But the Saxon lace has one advantage over ours, that of price; the cost of making it in the Erzgebirge and Vogtland is much less than in France. In this very important point of view, the Saxon lace beats us in the markets of America and Russia.

GREAT BRITAIN.

Three varities of lace are made in the United Kingdom: Irish lace, Buckingham lace, and Honiton lace.

Irish lace is like nothing in France or anywhere else; it is cheap, and the great number of women who work it do not get so much for it as our operatives. The different kinds of Irish lace partake of the nature of embroidery, fringe, crochet work, spindle and needle lace; they are sold only in England and America; the use of them has decreased in late years.

The Buckingham lace of England is chiefly made in the counties of Northampton, Bedford, Oxford, and Buckingham. The English lace-makers are skillful, they work with silk or thread and produce an article of excellent quality. In 1862 the business prospered, but it is now undergoing a crisis that may prove fatal to it. It sent nothing to the Exposition this year; the reason of this decline is the competition of Caen in edging and insertion, and of Grammont for larger pieces.

Honiton lace has a peculiar and characteristic quality; it is made in Devonshire, resembles white spindle gimp, with fine embroidered relief; some large pieces excel all other lace in elegance, perfection, and value. The samples of Honiton, exhibited by Hayward of London, were particularly admired; they united beauty of workmanship, grace of design, fineness of material, and harmony of particulars. It is so much in vogue that it has become the court etiquette of England to wear it, being distinguished for finish, brilliancy, and freshness. The guipure and application of Belgium are so dark they could not be used if not bleached in a solution of powdered carbonate of lead. This process is very injurious to the health of the bleachers, and for that reason the

English have abandoned it, and give premiums to the lace-makers that will deliver their work in a clean and natural state. This Honiton lace is the best in England; it is even superior to the best that is made in France or Belgium. Lace is also made in some of the English colonies; the best known is the thread and silk guipure of Malta; it is well made, of excellent quality, and is reasonable in price.

BELGIUM.

Next to France, Belgium gives employment to the largest number of lace-makers; the number is said to be over one hundred thousand, dispersed over the provinces of Hainaut, Flanders, and Brabant. They produce five kinds of lace: Valenciennes, Mechlin, Grammont, Brussels, and Flanders guipure.

VALENCIENNES is the best; it is extensively known, much sought for, and appreciated for its strength, lightness, and elegance. The business done in this lace amounts to twenty millions of francs a year. It has been vainly attempted to produce this lace in other countries, but Belgium enjoys the monopoly for its manufacture, and furnishes it to the world.

The four principal centers of manufacture are Ypres, Ghent, Bruges, and Courtray. The Valenciennes of Ypres, called square point, is the most esteemed. The execution of this elegant tissue seemed to have reached perfection long ago, and no improvement could be made in it; yet the rich collection of Valenciennes from the town of Ypres, varied in design, and clear in meshes, demonstrate an incontestable superiority in the skill of the operatives and the cleverness of their employers.

MECHLIN LACE was much in vogue a few years ago, it is a fine, light, elegant lace, to be had for a reasonable price; but it is out of fashion now, and very little is made.

GRAMMONT LACE has undergone a change; twenty years ago it was made entirely of white thread; now black silk is used for it. Its manufacture has increased five-fold since 1855; this is due to its good quality and low price. The meshes are not so close as in France; the difficulties of making it are so utilized as to substitute choice designs and intelligent combinations of execution, and thus furnish showy pieces at a lower price than anywhere else. Much is sent to America, Germany, England, and Russia. It certainly cannot compare with our elegant productions of Bayeux, but it may offer a formidable competition.

BRUSSELS LACE.—The lace factories of Brussels rival all the others in Belgium. Two kind of laces are chiefly made there: Single flowers, made by pin or needle, and intended to be applied on tulle, and gauze point, called Venice point. Application on tulle improves every day, yet it is strange its production does not increase, and we can give no reason for it. Gauze point, however, made a splendid show at the Exposition, it was rich, regular, clear, and of tasteful design. We must mention the establishment of Lefébure & Son, of Paris, carried on at Destelberghe, where application flowers are worked, as well as gauze point. This model

establishment unites the excellencies of the spindle and needle lace work, it sends new designs to the Paris market, that are artistically got up and rendered with perfect taste.

FLANDERS GUIPURE.—Other kinds of lace are made in Belgium, but they belong to the preceding categories. However, we owe a special mention to white guipure, made with a shuttle, called Flanders guipure. This lace is made at Bruges and in the neighborhood; it is an excellent imitation of the seventeenth century guipure; rich and loaded with designs, it is very light and elegant. It is like Honiton; but it is not so fine; the meshes are not so small, yet it is furnished at a reasonable price. It is one of the prettiest productions of the lace industry.

LACE-MAKING IN FRANCE.

There are six varieties of lace made in France: Alençon point; Lille and Arras lace; Bailleul lace; Chantilly, Caen, and Bayeux lace; Mirecourt lace; and Puy lace.

ALENÇON.—The French point lace, called *point d'Alençon*, is made at Alençon and Bayeux; it is the only kind of French lace that is made entirely with a needle; it has reached an incomparable perfection, and certain pieces are real objects of art. This is the most sumptuous of all laces, it has a strength that defies time and the washer-women, for that reason it merits the surname of *queen of laces*. Ever since the time of Colbert, Alençon and Argentan have been the center of this manufacture; but in 1855, Auguste Lefébure, one of our best manufacturers, started a factory for it at Bayeux, where he modified and improved the style so as to give it a desirable peculiarity. We have never seen anything to equal the Alençon lace from Bayeux, exhibited at the late Exposition.

LILLE AND ARRAS.—The manufactories of Lille and Arras formerly produced many blonde laces, on a clear ground, greatly esteemed for their freshness, lightness and good quality. When fashion no longer favored that style of lace, the manufacture diminished sensibly.

BAILLEUL.—At Bailleul and in the neighborhood, they weave a kind of Valencienne less fine and clear than that of Ypres, but which is greatly esteemed for its whiteness, its solidity and its cheapness.

CHANTILLY, BAYEUX, AND CAEN.—The dark-colored laces of these three places are identical; they are chiefly composed of large pieces, as shawls, robes, flounces, and veils, made of strips and patches admirably joined together by a peculiar stitch. The making of white silk blonde having been abandoned, on account of machine rivalry, attention has been turned to the manufacture of black laces, which has reached a great degree of perfection. The lace of Calvados and Chantilly cannot be surpassed.

Caen is celebrated for its varieties of black lace; it is in fact the commercial product of the place; much of it is exported. In 1855 Bayeux gained the first prize for lace, and it still retains its merited reputation

in that line. It produces the best large pieces of extra-fine meshes and rich designs, such as are sought after by the opulent classes."

Some years ago Mr. Schneider, president of the legislative body, wishing to give employment to the wives and daughters of his operatives, put up lace factories at Creusot, where elegant point lace is made, resembling that of Chantilly and Bayeux.

MIRECOURT.—The factory at Mirecourt has a reputation for the novelty, variety, and good quality of its laces; the operatives there are very skillful in their work; under an intelligent direction, they follow the freaks of fashion, and invent new patterns that are instantly accepted by customers and soon imitated by foreign manufacturers. It is certainly the most active and inventive lace-making place we know; being a kind of leader to all rivals. The articles exhibited were varied and of new style, and of course much admired, particularly a bed spread, a robe, and a chasuble in relief guipure.

Four or five years ago Madam Gaudillot, a woman of taste, tried to get the operatives of Mirecourt to revive old abandoned fashions; she finally succeeded, and her *art guipures* were immediately accepted, and gave origin to a new and cheaper style, called *Cluny* lace, which had wonderful success greatly benefiting French manufactures.

PUY.—If the Mirecourt factory is more ready at invention, that of Puy is more important. Its work spreads over four departments of Auvergne, and employs near one hundred thousand women and girls of the mountains. The central market is Puy.

The Auvergne laces, very various in style, are celebrated for cheapness; the operatives of this manufacturing cluster, stimulated by a few energetic and enlightened persons, have progressed sensibly within the last ten years. They can yield to the whim of the moment and use any textile material, flax, silk, cotton, wool, and wire, and when the demand for one style ceases, they modify their labor, invent a new style and spread it rapidly.

The manufacture here is very active and it improves every day. It exhibited a specimen for the first time, and it was found to be of difficult imitation; the piece was a bournous of Cashmere wool, having all the gaudy colors of an India shawl; the combination of variegated flowers on a lace foundation created much admiration. It cannot become an article of commerce, but it denotes progress and exhibits the skill of the Auvergne operatives, and the inventive talent of its manufacturers. There is also made in a small quantity at Puy, needle point lace of extreme fineness and of an artistic character, almost equaling the Venice point, now obsolete. Of all the lace-manufacturing districts of France, Puy sends the most productions abroad.

SUMMARY.

The number of lace-makers in France is estimated at 200,000 women and girls; their average pay is from one franc to one franc and a half

per day of ten hours' work; yet some earn as much as three francs and a half. This pay is influenced much by fashion with its imperious and ephemeral exigencies. All these operatives, scattered over fourteen departments, work at home, combining the labor of the spindle and needle with field labor and the more urgent duty of housekeeping. Thus lace-making has the advantage of being done at home in the family, without disturbing agricultural labor; it provokes no emigration and does not crowd girls in factories, but keeps them from all contact that would endanger their morals. For such reasons the business deserves encouragement as beneficial to health, to morals, and to comfort.

This industry also has the sympathy of all practical and elevated minds. Her Majesty, the Empress, has opened a *concours* for lace-makers, and has spent much money for their benefit. Many manufacturers and directors of benevolent institutions are trying to introduce this industry into families. In almost all our northern departments of France, as well as in Belgium and Germany, persons favored by fortune are rivaling each other in the establishment of schools for instruction in lace-making.

At Alençon, Dieppe, and Caen, the authorities join private individuals in the establishment of such institutions; but it is chiefly in Auvergne that the most has been done in this way. The prefect, the agricultural society, and the board of commerce at Puy, and all enterprising men of wealth there, have done what they could to improve the moral and hygienic conditions of the lace industry. Schools for apprentices are founded in all the communes; feasts are given to the best manufacturers, and premiums are distributed to the most expert operatives as encouragement to their energy.

The relations between manufacturers and their operatives are very cordial. In fact the lace-maker does not yield her liberty while she sells her time and skill; she can vary her occupation, and her labor is restricted to no certain term. If she is not satisfied with her pay she is at liberty to quit the work when she pleases and try some other; she can even give up what she has begun, if she finds the task too hard, or the compensation not sufficient.

Lace-making requires so many and varied designs, that the industry has created the specialty of art-designers.

Machinery is fast taking the place of hand labor in the production of garments; plain sewing and even embroidery can be done by machines, but they cannot make lace. Lace-making has nothing to fear from machines, which are fast giving a democratic tendency and popular simplicity to dress; dress now-a-days hardly distinguishes the different social classes. Clothes are now bought to wear for the season, not to keep, for fashion militates against that. The useful is more looked to now than the brilliant in costume; dresses are no more handed down as heir-looms like jewelry. Without deciding whether this is good or bad in itself, we must say it benefits the working classes. In spite of this change in the consumption of fine and costly articles of dress, lace-making has flourished, though the more costly styles of lace are not so much

in demand as formerly. The art must suffer a crisis; but every crisis produces a contest, encourages work, and provokes a healthy energy.

This, our national industry, is more favored in France than in other countries; in fact, there is little similarity between French and foreign laces. Each of our manufacturing districts has a peculiarity in its lace that defies imitation, and of course competition. Though the black lace of Grammont and the white of Saxony may be sold cheaper than ours, they cannot compete with us in novelty of execution. We are the creators, the inventors; foreigners are the copiers, the imitators. Their lace can sell only when ours is out of fashion. In short, the superiority of France in this industrial specialty is indisputable; it does not merely belong to the initiative spirit, nor to the perfect taste found in all our home inventions; it is the manifest consequence of the concentration of two forces, found combined in no national industry so perfectly and so harmoniously; that is, man's genius of discovery and the commercial expansion of the product; the talent of woman in the execution of a labor essentially of her domain, and in its appropriateness to all the caprices of a mode essentially French.

EMBROIDERY.

France, Switzerland, Saxony, Scotland, and Ireland, monopolize the industry of white embroidery, which is performed by machinery as well as by hand, by the tambour frame, the crochet hook, and the needle.

Embroidery in colors is more characteristic of the Orient, and from the eastern nations we find the most gorgeous and varied examples of that style; some of which may be mentioned, namely: From Turkey, slippers, caps, purses, handles for hookahs, and housings for horses, all rich with silk, gold and silver, embroidered over velvet and other materials; Egypt, carpets for prayers, one of violet and one of lilac velvet with gold scroll, and borders of silver; Russia, gold embroideries from Tiflis, upon crimson velvet of excellent design and skillful preparation.

The ecclesiastical vestments produced at Lyons and Paris are among the most elaborate and costly specimens of the art. Prominent among them was a chape of silver tissue by Barban, of Lyons, embroidered with gold, and a chasuble of gold tissue upon which, in bold relief, were figures partly composed of jewels; and from Paris, by Biais, a chasuble of cloth of gold, embroidered in gold, with vine, leaves, and wheat.

MANUFACTURE OF FANS.[1]

The making and sale of fans form one of the oldest branches of French industry, under the term of Paris articles. As early as the beginning of the sixteenth century, Italian perfumers introduced the use of fans at the court of France; later, when fashion assumed a Spanish tone, the fan was in great favor, and from that time to the end of the

[1] Extract, translated from the report of M. Duvelleroy, of the International Jury, Vol. IV, p. 322.

last century it became an essential part of a French lady's toilet. Thus we find that fan-makers were formerly among the guilds of art and trade in the city and suburbs of Paris. In 1673, an edict of Louis XIV constituted them into a legal body and approved their by-laws.

Fan-making has always given employment to a number of workmen of various trades, as joiners, gilders, glaziers, paperers, plumbers, painters, and embroiderers. All these had a hand in the manufacture of fans, which, however simple, require the aid of many trades. It was not unusual to see goldsmiths, jewelers, carvers, and painters at work in their various ways on this trifling object.

At that time fans were made at Paris of all values, from fifteen cents to forty pistoles. The commerce in fans, for exportation as well as home consumption, amounted to a considerable sum. Some manufacturers were said to make twenty thousand livres annually, by exporting fans, not counting profits from home sales of the same article. Spain, England, and Holland were the great customers of France for fans at that period. Spain was the only country that kept them; from the others they were sent to South America and the Baltic coast. France imported a few fans from China and Japan; but they were brought out because of their exquisite workmanship, and their value was exorbitant as objects of curiosity from a distance.

The part of the fan which forms the segment of a circle is called the *leaf*. This is sometimes plain, and of a single piece; but usually it is formed of two pieces of paper or other material, glued or pasted together; and often thin kid-skin is pasted on the paper. Satin, gauze, tulle, lace, crape, and other thin stuffs are used for the body or lining of the fan.

The leaf is fixed on a mounting called the heft or handle, without regard to other component parts; thus they say a heft or handle of pearl, ivory, steel, silver, &c. The strips that form the *neck* are of the same number as the pleats of the leaf; this is from twelve to twenty-four. Before the leaf is fixed on the handle, it is put into a stiff paper mold, with the number of pleats desired. On closing this mold of two pieces, and pressing it, the required pleats are made on the paper fan leaf. Between each pleat a copper plate called a *sound* is introduced. This process of pleating was once very complicated; the paper was first minutely marked; and in pleating, the lines had to be followed with great precision; the mold now does away with that tedious process. The strips are from ten to twelve centimetres in length, and it is on this surface that the carving, gilding, and painting are done. The outside strips are stouter than the others, to sustain the leaf. All the strips are united at the lower end by a rivet, the ends of which are sometimes ornamented with jewels or the precious metals.

The frames of fans are made in the villages of l'Oise, between Méru and Beauvais. The communes of Andeville, Coudray, Noailles, Boissière, and Ste. Geneviève are devoted to this work, which employs three hundred persons, men, women, and children. The principal materials used are

mother-of-pearl, ivory, horn, bone, tortoise shell, citron and sandal wood, ebony, cherry, locust, plum, pear, apple, and all sorts of exotic hard wood. The workmen carve, cut, gild, and chisel these woods with great skill; but unfortunately they are ignorant of the theoretical principles of design, which the younger generation is now introducing. They execute charming mosaics on the side pieces; they have long known the process of enameling, and some of the simple country people can rival the best artists of Paris in this kind of work. But it is in making open-work in ivory, pearl, and shell, that they have no rivals; and this solid lace is made by means of small saws, which they make themselves out of watch springs. They carve flowers and other ornaments exquisitely, and they are beginning to make figures in relief. If they will only study drawing, a prosperous future will open to them. In short, the fan frame goes through the hands of the woodman, the carver, the polisher, the dyer, the varnisher, the sawyer, the gilder, the burnisher, the sculptor, and the spangler.

The fan-leaf is all made in Paris. A painter furnishes the designs, which are lithographed, xylographed, or engraved on copper or steel; then the paper is printed, pasted, colored, or painted; made up, trimmed, spangled, riveted, and inspected. Thus a finished fan has to pass through twenty different hands, at least, though it may not sell for more than five centimes, or one cent.

The number of artists and workmen employed in this business in Paris and the Oise is over four thousand. The annual profits are ten millions of francs; three-fourths of the fans are sent abroad. Though this business has been carried on in Spain for thirty years, only common articles are produced. Italy makes a great use of fans, but manufactures none; we furnish fans to Italy. Portugal is the third European fan market in rank. The Spaniards and Portuguese carried with them to South America the habit of using the fan. Brazil, Mexico, Cuba, St. Thomas, Chili, Peru, and the Argentine Republic are famous markets for French fans. France also sends a few to the East Indies and Manila; but there China is a rival in the trade of the common article, but cannot compete with France in the production of fine fans. France also does a good business with the United States of America, where nothing but Paris fashions are acceptable. The late civil war that desolated that fine country injured the French trade considerably, but the business is again reviving.

There are no certain rules for the fan trade; it depends entirely on fancy. Tastes are infinite. The dealer must watch caprice, for there is no article of manufacture that requires less solidity; show is all that is necessary in a fan. All South American countries want gaudy articles, of brilliant colors, and odd designs; they require grace, beauty, and brilliancy even in a fan. The people there like subjects that depict the habits of their country, and have reference to their ideas of political independence. Experience and tact in this trade is the only guide for our manufacturers.

Some writers have attempted to prove that the fan is of Chinese origin, although it is found in every Indian country as well as in China. In support of this assertion the testimony of legends is invoked; hence the superiority that has long been attributed to China. Any one who will take the trouble to examine into the matter will find that France has nothing to fear from China, except in the production of ordinary fans; and that is not because we do not know how to make them, but because our workmen require and enjoy more material comfort than the Chinese can command in his country. Except in common fans we surpass the Chinese in the tastefulness and infinite variety of our designs, which are constantly changing. Paris and China monopolize the trade in fans, but all the fashionable people in Europe prefer French fans.

The flourishing condition of this commerce in the reigns of Louis XIV, Louis XV, and Louis XVI, was suddenly destroyed by the revolution; but when the peace of 1815 reopened the world to us, orders for fans came from all quarters, and they were manufactured hastily in great quantities, but of indifferent quality. It could not have been otherwise, for all the good old artists and workmen were dead, or had adopted some other business. Things continued thus till 1830, when the taste for antiquities having revived, objects of ancient art were much sought after. A few years before that period the Duchesse de Berry gave historical fancy festivals, and set everybody hunting over Spain, Holland, and Germany for the fine old fans the French refugees had carried with them into those countries. Many were found, but they were very costly, and that suggested the idea of reviving the industry as one of the fine arts.

With the assistance of eminent artists, like Gavarni, Diaz, Eugène, Lami, Camille Roqueplan, Glaize, Hamon, Cicéri, Eugène Isabey, Jacquemart, Feuchère, and the like, all painters and sculptors of the first order, the author of this notice, guided by the models he had on hand, attempted to imitate them and revive the manufacture of tasteful and costly fans without giving up the making of common fans, that gave constant work to country people, who tilled the ground in summer and made fans in winter.

It remains for us now to mention that France took the first rank for fans at the great French Exposition of 1867. Japan, India, and China sent to all our Expositions fans, screens ornamented with feathers, beetles, spangles of a thousand colors, pearls, and embroideries of silk, gold, and silver. All those articles are remarkable for the very brilliant colors, a secret in the land, and for the cheapness of the workmanship; but nothing was new, the same models had served them for centuries. Spain has made no progress in common articles, and France still furnishes fine fans to that country. Austria exhibited some fans of carved wood; they are called broken fans in trade. The article is a passing fancy, and can never form a special industry; moreover, France makes

the same articles at less price and in better taste than Austria. Mr. Schwartz, a Danish trade-sculptor of Copenhagen, exhibited an ivory fan with bas reliefs representing Thorwaldsen's seasons; it is a beautiful piece of work, but is the labor of an amateur and not of a mechanic. Belgium exhibited some splendid black and white lace fans in Class 33.

The collections of fans at the Exposition were of two kinds, fans for the rich, and fans for export. Three houses, Duvelleroy, Alexandre, and Aloys van de Voorde, furnished most of the costly fans; their articles were adorned by some of the first modern artists, as Gavarni, Colin, Hamon, Philippe Rousseau, Karl Müller, Diaz, Eugène Lami, Miss Meley, and Madame Girardin. Of the trade-sculptors and designers we must mention Jean Feuchères, Kagmann, Jacquemart, Fannière brothers, Lanoy, Vailland, and Norest. The most important house, in a commercial view, manufacturing export fans, is that of M. F. Meyer. Next to that comes the house of Fayet, Buissot, Brecheux, Toupiller & Co., Vanier, Taveaux, and Caumont. All these houses do their best to unite art and industry in the articles they manufacture for exportation, catering to the taste of the countries where the products are sent.

Among the principal inventors we must mention Edward Petit, who improved the closing fan, and Alphonse Baude's fan mold. The latter invented the machine for punching fan-frames, the best known at present.

We are convinced, from our attentive examination through the Exhibition, that France has no foreign competition to fear, and that France still holds the first rank among the tasteful industries combining art and manufacture.

GLOVES AND SUSPENDERS.[1]

Gloves were better represented this year in the Champ de Mars palace, Class 34, than they were at any former Exposition. France had twenty-seven exhibitors; Belgium, Austria, Germany, Italy, Spain, Denmark, and Poland took part in the exhibition. We will examine the business in each one of those countries, beginning with France.

FRANCE.

France produces, annually, nearly two millions of dozens of kid gloves, of first, second, and third qualities, at the average price of forty francs a dozen, making a business of eighty millions of francs. Three-fourths of these gloves go abroad; for in no other country of the world are gloves made so elegantly, well fitting, and cheaply as in France. Seventy thousand persons are employed in the glove business in France.

The principal glove factories are at Annonay, Paris, and Milhau, for white leather; Paris, Grenoble, Chaumont, Saint Junien, Lunéville, Rennes, Nancy, and Blois, for gloves; Niort for buck, beaver, and chamois military gloves; Vendome, Niort, and Milhau, for chamois.

[1] Translated from the report of M. Carcenac, of the International Jury, Vol. IV, p. 330.

ENGLAND.

Next to France, England is the country that produces the most and best articles; yet it is largely indebted to our industry, and imports from us every year quantities of raw material for its factories. Till recently England had the monopoly of dog-skin gloves, but after some trials France has succeded in making them as well as our neighbors.

Our knowledge is confined to a single English house, that of Dent, Alcroft & Co., which does a business of thirty millions of francs a year, buying, at the same time, twelve millions in gloves from France.

England had no exhibitors at the Exposition.

RUSSIA.

A few French manufacturers settled in Russia and opened their industry in that country; they continue to buy their white skins from France, and even have them dyed and cut here; and, as they make the best quality, their business rivals ours, and has absolutely closed Russia to our manufacturers.

BELGIUM, GERMANY, AND AUSTRIA.

Glove-making has not remained stationary in those countries, and the trade was well represented at the Exposition of 1867. Cheap articles are in favor there. Lamb skin gloves are extensively manufactured, except in Belgium, where kid is preferred, and they are generally sold at home, very few being sent abroad. Our manufacturers should notice this competition and prepare to contend with it, as it is likely to increase, and, perhaps, become formidable.

ITALY.

Gloves are cheap in Italy, but the quality is not good. Most that are made there are consumed in the country, so our manufacturers have nothing to fear from that quarter.

SPAIN, PORTUGAL, SWEDEN, NORWAY, DENMARK, AND POLAND.

The gloves made in all these countries are consumed at home; however, Spain is making improvement in the manufacture of gloves, and they are well made. We must mention that some handsome Swedish gloves were exhibited by a Frenchman living in Copenhagen.

Up to this time France has kept the lead in the glove market of the world; but our success excites emulation abroad, and many foreign manufacturers in other countries are now making gloves of such elegance as to attract the attention of distant customers and excite our own envy. Our exports to Russia, Germany, and Belgium have perceptibly diminished, and other markets of the world may soon be closed to us.

In consideration of future impediments to French glove-making, our manufacturers should hunt out and adopt the best methods of produc-

tion; we allude to the division of labor, a system that was opposed at first, but will finally succeed, as it will cause a better style of manufacture, and will become more profitable to the laborer. The prosperity of the large establishments that have adopted the system of division of labor shows its advantages.

It is impossible to see that machine-cutting is far preferable to hand-cutting, just as the adoption of the *ridelle* has produced regularity in cutting. The great advantage in the system of labor division consists in correctness and management of work, and customers have lately found this out. The system of the division of labor has already been adopted in Belgium and Austria. Since its adoption in France the pay of glove-makers has advanced from twenty to fifty per cent., and it furnishes constant work to women and girls, giving them an honest livelihood.

The introduction of tawing in France helped the Annonay factory, facilitated the treatment of hides, and utilized much raw material that was formerly useless; thus doe-skins that were only used for inferior gloves up to 1862, now serve for a glove equal to the English dog skin glove.

The production and consumption of skin gloves has greatly increased in ten years, and, of course, the raw material has increased in cost; thus hair-skins that sold for forty-five francs a dozen at Poitiers or Chalons, ten years ago, now bring sixty-three francs a dozen; and though this has raised the price of gloves to the consumer, the manufacture of gloves has in no way decreased.

Skins intended for gloves undergo many manipulations, according to the quality of gloves to be made out of them; thus they are tawed for glossy gloves and Swedish gloves, and furred or "*ramaillées*" for buck or beaver gloves. The tawing of skins is intended to deprive them of hair, and take out the fatty matter of the skins, as well as to give them the softness necessary for the factory. After maceration in a solution of lime and orpiment for some time, the skins are curried and beat, and subjected to various processes to take out the lime and grease, and give them the requisite softness. They are then fermented to soften the fibers, the fermentation being stopped by a mixture of flour, yolk of eggs, and alum; they are then dried and spread out.

Chamois skins undergo a similar process. To dress sheep and lamb skins properly, they must lie longer in lime, to remove the wool. The sheep-skins are then split by means of a fine saw. The hair side serves for morocco; the flesh side is used for coarse army gloves. Lamb skins are too thin to undergo this process, but they are shaved or ruffed, and serve thus for castor gloves. After passing over the trestle, all skins are pressed and fulled; then they are put into a tub of greasy water, to remain till used. After having been dried they are pumiced.

Beaver and deer skins are pumiced after they have been colored.

As we have already mentioned, sheep and lamb skins are chiefly used for castor gloves; ordinary doe-skin may be used for the same purpose; doe-skins from Servia have been tried on a small scale.

ELASTIC TISSUES.[1]

SUSPENDERS, BELTS, GARTERS, AND BRACELETS.

France, Austria, and England represented this industry at our fair; France took the lead. The progress in this has been great and rapid, for it only dates from the time when India-rubber was first made into fiber, not many years ago; yet it has reached a great degree of perfection.

Judging from the articles exhibited, Austria has not succeeded in making suspenders. England is represented by one house, that sent enough articles to show the style of her manufacture. If the houses in Leicester and Birmingham, that manufacture this kind of goods exclusively, had sent some of their productions, we could have judged better of the importance of this business among our neighbors.

We make nine millions of francs' worth of suspenders, belts, and garters, per year, one-third of which sum is sold at home; the rest is sent to America, Holland, Italy, Germany, Switzerland, and Belgium.

Before the use of gum tissues came into fashion, the bodies of suspenders were made of cotton or leather, and the springs were of brass wire placed at each end, to give them elasticity. When Ratlier and Guibal introduced gum cloth into France, the old-style suspenders and garters disappeared. Rouen was the first city to take advantage of this novelty, and the two large houses of Lucien Fromage & Co., and Rivière & Co., make at least half the articles of this kind produced in France. Mr. Fromage has done most for the business. He was first a weaver, then overseer, designer, machinist, and inventor. When we are told that the house sells suspenders at ten centimes and six francs a pair, and garters at four centimes and three francs, we can judge what the business must be, knowing the amount done per year.

The gum-cloth business gives employment to fifteen hundred operatives at Rouen. The pay of men is from three to five francs a day; for women, one to three francs; and for children, from ninety centimes to one and a half franc. The other factories for such articles are at Paris and Saint Étienne.

The war in the United States forced manufacturers to use flax and jute instead of cotton, to keep their productions at a reasonable price; and competition now affects them. The use of cotton has been resumed in the tissues.

[1] From the report of M. Carcenac of the International Jury, Vol. IV, p. 337.

CHAPTER V.

INFLUENCE OF CLOTHING UPON HEALTH.

INFLUENCE OF WOOLEN CLOTHING UPON HEALTH—EFFECTS OF WOOLENS UPON THE SKIN—SHAGGY WOOLEN GOODS—PROTECTION AFFORDED BY WOOLENS FROM THE EFFECTS OF SUDDEN CHANGES OF TEMPERATURE—WOOLENS SHOULD BE WORN AT NIGHT—EVIL EFFECTS OF CLOTHING IMPERVIOUS TO AIR.

Regarding it as not uninteresting and as of great practical value to add to this report some remarks upon the hygienic influences of woolen clothing, I have procured the following memorandum on the subject from Dr. A. P. Merrill of New York, formerly a surgeon in the United States Army, and latterly a medical practitioner and writer of distinction.

Notwithstanding the common use of woolen clothing in both ancient and modern times, and the favorable impression made upon the minds of men in regard to it in civilized and in barbarous communities everywhere, its virtues and excellences are as yet scarcely understood and appreciated among the mass of mankind. Woolen clothing is very generally adopted and worn without inquiry as to its effects, or the manner of producing them. The proper study of the subject implies a knowledge of physiology as connected with its hygienic influences, and more or less of pathology in reference to its remedial power. Without adverting to these in their details, which would occupy too much time and space, I venture to present some views briefly, upon the general subject.

The porosity of woolen goods is greater than that of silk, cotton, and linen fabrics, by which both absorption and evaporation of the perspirable fluids is facilitated, and thus are they dissipated from the body, keeping the surface comparatively dry and warm in cold weather, and reducing the temperature of the skin in hot by the cooling process of greater evaporation. By virtue of this porosity, also, air is retained in woolen textures, serving to increase their non-conduction of heat, and thus affording protection from the deleterious effects of sudden changes of temperature. This important feature of porosity in woolens is increased by the nap upon the surface, and they therefore become less efficient in shielding the body from cold when worn threadbare. Shaggy woolen goods, in the making of which the manufacturer attempts an imitation of the arrangements of nature in protecting animals from the influence of cold, are valuable as outer coverings, on account of the increase of this quality afforded by the nap. The sheep, of all animals, is best protected in this way; but the wild animals inhabiting hyperborean regions, and especially such as seek their food in the icy waters of the Arctic Ocean, are provided with a dense coating of fine fur next the skin, with a longer, coarser, and less compact hairy covering, both which are

imperfectly copied in woolen fabrics, with a shaggy surface. In the use of flannel next the skin, this non-conducting power is increased by wearing two thicknesses of thin woolens, which afford better protection in cold weather than can be derived from a single covering containing an equal quantity of wool. More air is retained between the folds, and non-conduction of heat is further facilitated by the threads of one of the textures covering the interstices of the other.

To this valuable quality of porosity and non-conduction of caloric in woolens is added the wholesome irritation of the skin produced by the friction of the woolly fiber, which, except in persons of undue cutaneous sensitiveness, is not a source of discomfort. The proportion of cases is small in which this difficulty may not be overcome by the habit of wearing flannel next the person, in both cold and warm weather. The fact of its being felt in some instances to an uncomfortable degree is evidence that the uniform excitation of the skin by woolens, even when unnoticed by the wearer, is one of the qualities to which its hygienic and remedial powers are due. This is not only useful to the skin itself, increasing and sustaining its functions as an important emunctory organ, but by reason of the sympathy existing between all the dermoid tissues, and especially the skin and the mucous tissues of the digestive organs, this cutaneous excitation caused by woolen garments exercises beneficial influences over the internal organs of the body in both health and disease. Hence the advantages derived from clothing debilitated persons, and especially children of slender organization and impaired digestion, in flannel. Children suffering from an abnormal irritability of the intestinal canal, causing either habitual constipation, or, more commonly, persistent diarrhea, derive great benefit from the use of woolen clothing. Under the erroneous impression that the invalid may suffer discomfort or injury from the supposed heating influence of woolen goods, the use of them is sometimes restricted to the winter season; but besides the exceptional cases to which I have referred, it is found by experience that both comfort and health are subserved by the constant wearing of flannel next the skin. Changes of season and climate require no other modification than the substitution of thick flannels for thin in winter, or, what is generally better, the addition of another garment over the one worn in summer.

The agency of woolens in protecting the body from the evil effects of sudden changes of temperature is well illustrated by the use of loose garments of thick woolen goods in furnaces and smelting works, where the bodies of the operatives are much of the time exposed to a high temperature, inducing them to seek, as often as they may have it in their power, the comforting influences of cold air. All observation proves that the constant use of woolens under such circumstances is conducive to both comfort and health; and we have little need of other argument in favor of the proper use of flannel garments in warm weather.

Were it not that people are constantly exposed to the action of causes

of disease in these sudden transitions of temperature, in serious errors habitually practiced as regards the choice of both food and drink; in all the irregularities of exercise, rest and sleep; in malarial, epidemic, and contagious influences, and in all the uncertain and little understood agencies of bodily and mental disorder by which we are surrounded, it would be of little consequence about the choice of clothing for healthy subjects. But when we consider that some one or more of these disturbances of health is always acting, and that individuals are liable to the disorders produced pretty much in proportion to their predisposition to disease, it becomes important that we should be able to avail ourselves of every known preventive agency. In doing this it must be borne in mind, that this predisposition is generally greatest in the night and during sleep, at which time most attacks of disease are inaugurated. So common is this, indeed, that it has been and may well be doubted, whether any of the fatal epidemics prevailing in modern times ever make their onset upon an individual in the day-time. Certainly it has been sufficiently proved by long experience and observation, that persons residing in the neighborhood of places infected with yellow fever, cholera, or plague, may visit and administer to the sick during the day with safety to themselves; but if they venture to pass the night among them, especially should they have the temerity to sleep at night where the disease prevails, an attack is well-nigh inevitable.

The danger of night exposure to the causes of disease is illustrated by the experience of sailors on the coast of Africa; and also by the imprudent exposure of white men in the rice fields of the southern States. Such exposures during the night almost invariably invite a serious attack of endemic disease, even when such disease is not prevailing to an unusual extent in the locality visited. In numerous instances, also, children are attacked by disease in the night, in consequence of an exposure of the body to the atmosphere without proper covering. These deleterious influences of night in creating predisposition are apt to impress people with the idea of the constant unwholesomeness of night air, as differing in some respects from that respired during the day; but in most cases the effects are probably due to other causes. Were it not so, we could place little reliance upon preventive measures, for we have no means of dispensing with the use of night air. The principal if not the only injury resulting from its respiration, is probably from its chilling influence upon the lungs, which is instinctively guarded against by animals and savages by covering the nose. The birds place their beaks beneath their wings and feathers, other animals bury their noses in their furs or under their legs, and the negro instinctively hides his head beneath his bedding in the midst of his soundest sleep. Perhaps this practice, so universal, affords evidence, also, that in night respiration the animal system requires less oxygen.

We are thus admonished of the necessity of adopting precautionary measures against both predispositions to and attacks of disease during

the night; and of all the suggestions which have been made with these views, none are believed to be of greater value than that of wearing flannel next the skin. All the arguments in favor of such use during the day are of equal and even greater force at night, for the body requires the superficial irritation, the absorption and transmission of the perspirable fluids, and the non-conduction of heat, even more during the sleeping than during the waking hours; and then, there are said to be certain physiologic necessities for air to be brought into contact with the skin both in sleeping and waking. The garment worn next the person while sleeping, therefore, should always be of wool, and those worn during the day dispensed with. To make the arrangement complete, and to give the sleeper the full benefit of woolen stuffs at the time of his greatest need, the sheets should also be of wool, and all the covering above the sheets.

In cold weather complaint is sometimes made that woolen bedding does not afford sufficient warmth without an uncomfortable amount of weight. Every additional thickness, however, aids in the retention of air amid the textures, retarding evaporation and the radiation of heat from the body, and affords a medium, also, for the absorption of the fluids of perspiration, all which are facilitated by the selection of woolens well covered with nap. Additional warmth may readily be secured by placing over all the woolen coverings, or between the different textures, cotton or linen spreads, sheets, or even paper. But after a while, in this case, the body of the sleeper, for want of evaporation, becomes moistened with the fluids of perspiration, making him liable to cold, besides removing the oxidating quality of the air, subjecting the sleeper to more or less depression of nervous energy. It is not uncommon, therefore, for persons trying this experiment to rise in the morning with headache, and with a feeling of languor and exhaustion, disqualifying them for their performance of their daily duties. The use of quilts, bed-spreads of various kinds, comforts filled with cotton or feathers, oil-cloths, paper, and cotton and linen sheets, is to be deprecated as in some degree detrimental to health. Robust and vigorous subjects may not readily feel the injurious effects, but feeble constitutions, women of great nervous excitability, and children, cannot subject themselves to these evils habitually without becoming aware of declining health and energy. Next to flannel and woolen blankets the best covering is the comfort filled with carded wool, but this should be made of woolen textures of some kind. When impenetrable coverings are used they should be placed exterior to all the rest, that there may be a better chance for the absorption of the perspiration by the intervening woolens, and for the circulation of air in contact with the body. Sometimes it is sufficient to lay such coverings across the feet, leaving all the rest of the body to be covered by woolens alone.

In the selection of woolen clothing the same principles are applicable, and the same precautions advisable as in the arrangement of bedding.

Garments worn next the person are better made of flannel than of the hosiery now in common use. The better nap of the flannel gives it an advantage, and what is of greater importance, the flannel garment is not apt to embrace the person so closely. Tightly fitting garments impede the circulation of the blood in the skin, and retard the important functions of secretion and absorption, besides preventing in some degree the contact of air. There are objections to every kind of woolen hosiery, and also to the use of the corset, which probably does more injury to health by its pressure upon the skin, confined as it is between the corset and the ribs, and its imperviousness to air, than by the embarrassment given to the organs of respiration. Many women wear their corsets too loosely laced for the latter effect, without escaping the former. As this article of dress is not likely to be dispensed with, it would be improved by being made porous, so as to favor the transmission of vapor and air; and by being shaped and fitted to answer its purposes of compression, with a broad opening at the places of lacing upon the back and sides.

In the further application of the views and principles herein advocated, as applicable to personal clothing, it is desirable to avoid the use of cotton or linen fabrics over the woolens worn next the person. To these there are the same objections as to the sheet over the woolen night-gown. If such obstructions to evaporation and circulation of air be used during the day, it is better that they be worn more remote from the surface of the body, with a greater number of woolen tissues intervening. Perhaps the water-proof overcoat may be less objectionable in the day, than the counterpane and comfort at night, even, although it may be less porous, and a better conductor of heat, because it sets more loosely upon the person, and admits of a better circulation of air beneath it. In the manner of using coverings of the body for the preservation of health and comfort, as well as in the means of preserving a healthy skin by frictions, and even in the matter of selecting food in reference to quality and quantity and times of feeding, we may sometimes derive useful instruction from the practice of men skilled in the care and management of valuable horses. The skins of these animals are subjected to frictions, bathings, and protection from cold, requiring an amount of labor and skill, one-half of which might often secure the children of the family from attacks of painful and dangerous disease.

The feet are best protected by stockings made of common flannel, while boots and shoes should be sufficiently porous for the transmission and evaporation of the perspiration, to prevent the accumulation of moisture. Neither the stocking nor shoe should fit so closely as to impede the cutaneous circulation. Water-proof shoes secure warmth for a certain time, but when worn too long and the feet become moist from the accumulation of moisture this advantage is lost, and warmth and dryness can hardly be restored without exposing the bare feet to the

fire. Excessive and morbid secretions are often caused by confining the feet in close-fitting and impervious coverings, giving rise to habitual coldness, and operating injuriously upon the general health.

Silken fabrics are next to be preferred to woolen, and cotton stuffs are better than linen. Something might be said of electric influences in connection with all these, the greatest non-conducting-power being awarded to silk. But this is a branch of the subject less thoroughly understood, and the reports which have been made in regard to electric treatment of disease leave the question of these influences in much doubt. Indeed the action of electric currents, and the use of conductors and non-conductors of electricity in clothing, either as remedies for or preventions of disease, afford little encouragement to hope for or expect important results, until new discoveries are made in regard to these agencies.

Although the views given in this paper may be in the main correct, there are exceptions and anomalies in connection with them which deserve consideration. Sometimes there exists in individuals and in families a sensitiveness of the surface of the body which renders the irritation of woolens painful and even productive of cutaneous eruptions, and occasionally cases are met with in which colored flannels prove more troublesome than white. Used as a remedial agent also, woolens, so often useful, fail to produce the good effects expected from them, and rheumatic and neuralgic pains are relieved by wearing linen, cotton, or silk next the skin, woolens being continued as outer garments. It should be stated, also, that although woolens should in general be loosely worn, it is often the case that both adults and children, suffering with chronic diseases of the stomach and bowels, derive great advantage from wearing a broad woolen band drawn evenly and somewhat firmly round the body below the chest. For want of the firm resistance prevented by the ribs in the use of the corset, cutaneous circulation and secretion are not seriously impeded, while the pressure thus given appears to afford increased tone and vigor to the organs of digestion, and to all the abdominal viscera.

STATISTICAL TABLES.

*Statistics of wearing apparel, hats, boots and shoes, &c., produced in the United States in the year ending June 1, 1860.**

Class of article.	Number of establishments.	Capital invested.	Cost of raw material.	Average number of hands employed.		Annual cost of labor.	Annual value of product.	
				Male.	Female.		In 1860.	In 1850.
Hosiery	197	$4,035,516	$3,202,317	2,780	6,323	$1,661,972	$7,280,606	$1,028,102
Shirts, collars, &c	219	2,256,500	3,920,607	528	15,068	1,634,992	7,218,790	
Clothing for men	4,014	27,246,093	44,149,752	41,837	72,963	19,856,426	80,830,555	
Boots and shoes	12,487	23,357,627	12,728,174	94,512	28,514	30,938,080	91,889,298	53,967,408
Ladies' clothing	188	1,421,650	3,323,335	889	4,850	1,193,032	7,,181,039	
Millinery goods	975	1,357,300	2,940,604	1,012	7,553	1,576,160	5,259,903	
Hats, caps, &c	667	5,247,672	8,771,997	7,610	4,258	3,857,104	17,603,482	
Gloves and mittens	126	594,825	537,589	453	976	330,409	1,176,795	
Embroidery	3	11,000	13,400	3	78	14,244	56,216	
Fringes, trimmings, &c	95	1,262,780	1,527,769	940	1,841	647,996	2,992,922	
Straw goods	70	1,357,300	2,940,604	1,012	7,553	1,576,160	5,250,903	
Sewing silk and twist	42	1,675,900	2,378,521	583	1,996	387,312	3,596,249	
Totals	19,083	69,824,157	116,434,669	152,159	151,973	63,673,897	230,345,758	....

* Condensed from Eighth Census Report on Manufactures.

India-rubber goods are omitted from this table for want of information as to what proportion of them come under the description of wearing apparel or boots and shoes. The total production for 1860 amounted to $5,768,450.

*Statistics of manufactures of such textile fabrics and articles worn on the person as were taxed under the internal revenue laws as the production of the United States, for the year ending June 30, 1868.**

	Amount of tax.	Percentage on value.	Value of product.
Cloth and other fabrics of cotton	$6,322,000	5	$126,000,000
Raw cotton †	22,501,000	....	
Cloth and all textile knit or felted fabrics other than flax or jute and not elsewhere enumerated	123,200	5	2,464,000
Woolens	2,813,000	2½	112,520,000
Silk and manufactures of	133,000	5	2,666,000
Clothing:			
Articles of, not of wool, woven, felted, or knit, or from fur or fur skins	121,000	5	2,420,000
Articles of, from fur	76,000	2	3,800,000
Articles of, from India-rubber	7,600	5	152,000
Boots and shoes, including those of India-rubber, and shoe strings	2,000,000	2	100,000,000
Leather	1,600,000	2½	64,000,000
Hats, caps, bonnets, and hoods	425,000	2	21,250,000
Umbrellas and parasols	....	....	....
Watches and chains	56,000	5	1,120,000
Hair	....	....	....
Gloves, mittens, and moccasins made by sewing	52,400	2	2,620,000
Hoop skirts	94,000	2	4,700,000
Paper collars and all articles of dress made of paper	51,100	2	2,555,000
Pins	29,000	5	580,000
Thread	167,000	5	3,340,000
Total	....	....	450,247,000
Diamonds, emeralds, precious stones and imitations thereof	337,600	5	$6,752,000

* Condensed from the Commissioner's report.

† 3 and 2½ cents per pound.

PARIS UNIVERSAL EXPOSITION, 1867.

REPORTS OF THE UNITED STATES COMMISSIONERS.

REPORT

ON

EDUCATION,

BY

JOHN W. HOYT,

UNITED STATES COMMISSIONER.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1870.

INTRODUCTORY LETTER.

MADISON, WISCONSIN, 1868.

SIR: I have the honor to transmit herewith the Report on Education, which, as one of the Commissioners to the Paris Universal Exposition of 1867, it was made my duty to prepare.

The work has not been a light one. Important in character and considerable in extent as it seemed in its first general aspect, in the detail of acccomplishment it has, of necessity, grown quite beyond the usual limits of such a report, while yet failing to meet the just demands of that great occasion.

If, therefore, because of insufficient time for their due preparation, or too limited space for their proper discussion, or for any other reason, I have failed to make a satisfactory and effective presentation of facts and conclusions, I shall, nevertheless, hope that some good may come of my endeavor to give a comprehensive view of the present condition of all classes of education in the countries there represented.

Very respectfully, your obedient servant,

J. W. HOYT,
United States Commissioner.

Hon. WILLIAM H. SEWARD,
Secretary of State.

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ERRATA.

REPORT ON EDUCATION.

Owing to the remoteness of the author of this report from the place of printing, it was not possible to have the benefit of his revision of the proof-sheets. It is not, therefore, surprising that errors have passed unnoticed which might otherwise have been corrected. It is hoped, however, that most of those which have escaped the attention of the editor may be easily corrected by the reader. The more important ones noticed by the author in a hurried reading are the following:

Page 36, eighth line, after "attendance of" insert 1,500.

Page 39, twelfth line, for "1,300,000" read 1,400,000.

Page 83, middle, for "Woodward and Hughes High School" read *Wood and Hughes High Schools*.

Page 102, third line, for "provisions" read *provision*.

Page 117, ninth line, for "culture" read *cultured*.

Page 221, third full paragraph, eighth line, for "is believed" read *are believed*.

Page 228, fifth line, for "stoichometry" read *stoichiometry*.

Page 238, fourth full paragraph, fourth line, for "open" read *opened*.

Page 244, third full paragraph, first line, for "military, medicine, &c.," read *military medicine*.

Page 246, sixth line from the bottom, after "in the world" read, *except the University of Berlin*.

Page 250, first full paragraph, end of third line, read, "and *as* is acknowledged."

Page 260, end of third and beginning of fourth lines, for "economy. Besides, &c.," read, *economy,—besides*, &c.

Page 262, first line of paragraph next the last one, for "Statvidenskahlige" read *Statvidenskabelige*.

Page 263, first line, for "Faculteten" read *Facultet*.

Page 268, fourth line from end of first full paragraph, for "ducal" read *dual*.

Page 280, third full paragraph, fifth line, for "has" read *have*.

Page 285, last paragraph, second line, for "men" read *man*.

Page 286, fifth line from the bottom, for "letter" read *letters*.

Page 301, third full paragraph, third line, for "professor" read *possessor*.

Page 304, first full paragraph, last line, after "consistories" read *are*, &c.

Page 309, seventh line, for "16" read 15.

Page 322, middle twentieth line, for "classes" read *class*.

Page 323, fourth full paragraph, second line, after "Aberdeen" read *University*.

Page 332, second full paragraph, first line, for "Privat-docenten" read *Privat-docent*.

Page 351, first full paragraph, fourth line, for "metrodology" read *methodology*.

Page 370, first paragraph, middle twenty-seventh line, for "three" read *the*.

Page 372, eighth line, for "*jenst fö ratlande Kansler*," read *Tjenstförrättande Kansler*.

Page 372, second paragraph, fourth line, for "*wissenschaftlichen*" read *wissenschaftliche*.

GENERAL SURVEY OF EDUCATION.

CHAPTER I.

INTRODUCTION—THE EXTENT OF EDUCATIONAL REPRESENTATION AT THE EXPOSITION.

THE VALUE OF EDUCATION IN SCIENCE AND ART SHOWN BY THE GREAT EXHIBITIONS—THE DEPARTMENT OF SOCIAL SCIENCE—THE GENERAL DISTRIBUTION IN THE EXPOSITION OF THE EDUCATIONAL EXHIBITS—NUMBER OF EXHIBITORS IN CLASSES 89 AND 90—THE VARIETY OF OBJECTS—NUMBER OF PRIZES AWARDED—THE GENERAL SCOPE OF THE REPORT.

The first universal exhibition taught this important lesson—that the most advanced nations were those in the midst of which, for the longest period and in the freest and most generous manner, science and art had done their work of enlightenment. The next succeeding ones not only enforced this lesson but added the important deduction, that prosperity and enlightenment are not accidentally coincident, but necessarily so; sustaining to each other the relation of effect to cause. When, therefore, the time came for determining the plan of a fourth universal concourse, in the spirit of a noble philanthropy that did honor to our common humanity, it was proposed that this great principle of progress should have practical recognition in the form of a separate division, or group, the scope and purpose of which warrant the designation happily given it by the Imperial Commission, of the "Department of Social Science"—a department whose office should be to set this grand law of development before the nations and in the most solemn and authoritative manner to commend it to the observance of all.

If Napoleon III had signalized his eventful career by no other shining act done in the interest of humanity, the imperial decree which opened Group X, and created "the New Order of Recompenses," "with a special view to the amelioration of the moral and physical condition of populations," should of itself place his name on the page of permanent history in letters of light, and insure to his memory the benedictions of mankind.

What may be styled the educational department of Group X, of the late Exposition, was embraced in two classes, (89 and 90,) appropriately placed at the head of the group, as relating to a subject thus acknowledged to be first in the logical order of such as directly concern the social improvement of man. But, inasmuch as the group itself could

have no definite assignment of place, owing to the diverse nature of the objects exhibited, it followed, as a consequence, that the exhibits in the educational department were distributed throughout the entire Exposition palace and grounds, thus making their inspection and comparison a protracted and somewhat difficult task.

The number of exhibitors in this department, properly catalogued, was no less than one thousand and ninety-five, distributed by nationalities as follows, the order of mention being that of the local succession of countries in the Palace:

Table showing the comparative number of exhibitors in Classes 89 *and* 90.

Nationality.	No.	Nationality.	No.
France	602	Sweden	14
Netherlands	4	Norway	(*)
Belgium	21	Russia	3
Prussia	16	Italy	69
Saxony	(*)	Pontifical States	1
Hesse-Darmstadt	2	Turkey	1
Baden	1	Egypt	2
Wurtemberg	53	Morocco	1
Bavaria	5	United States of America	(*)
Austria	86	Brazil	1
Switzerland	10	Argentine Republic	1
Spain	139	Sandwich Islands	1
Portugal	(*)	Great Britain	35
Greece	5	British Colonies	8
Denmark	14	Total	1,095

* Exhibitions made, but not catalogued; number not known.

The real number of exhibitors was considerably larger, as many of them made entry in other classes, to which the articles shown were also appropriated.

The objects themselves numbered many thousands, one entry—as that of a school-house, for instance—often including many individual articles collectively shown by the nation, society, or individual making exhibition.

The variety of objects was only less than their number, extending through the whole range appropriate to the work of education, and affording ground for a discussion of every educational theme, from the material appliances essential to the infant school up through every grade of intermediate schools, general and special, to the scheme of the royal academy or university. In the Park were school-houses, with furniture, apparatus, and numberless appliances, together with several pavilions, embracing a multitude of educational appliances used in schools of agriculture and mechanical industry, and the no less numerous products of the handiwork of the artistic or scientific skill of the pupils. In the Palace were numerous halls, alcoves, and attractive corners, filled with

charts, maps, atlases, globes, orreries, slates, copy-books, contrivances to aid in teaching children to read, write, and calculate; text-books from the primer to the calculus and the classics; schemes and reports of educational institutions of every grade and character; copies of annals published by educational societies, institutions, and states; the implements used in gymnastic exercises, and the appliances requisite to instruction in the arts of design, architecture, painting, and sculpture. Some of the halls embracing these, and countless other objects equally appropriate to the educational department, were very beautifully and effectively set off by portraits, busts, and statues of distinguished teachers and patrons of education in all countries, as well as by the inscription of the names and living words of such as, by their labors for the diffusion of knowledge among men, have made them immortal.

Of the relative importance of the exhibits made by the different nations, some idea may be formed from the following:

Table showing the number of prizes, of different grades, awarded to the exhibitors from various countries, in Classes 89 *and* 90.

Nations receiving awards.	Grand prizes.	Gold medals.	Silver medals.	Bronze medals.	Honorable mentions.	Total.
France	......	9	47	87	135	278
Netherlands	......	......	......	......	1	1
Belgium	......	1	1	2	6	10
Prussia and North Germany	......	5	2	7	10	24
Hesse-Darmstadt	......	......	1	......	......	1
Baden	......	......	......	......	1	1
Wurtemberg	......	1	1	1	4	7
Bavaria	......	1	1	......	......	2
Austria	......	2	5	6	9	22
Switzerland	1	......	......	1	1	3
Spain	......	......	1	5	13	19
Denmark	......	......	1	1	4	6
Sweden and Norway	......	1	1	1	......	3
Russia	......	......	1	......	......	1
Italy	......	1	7	9	12	29
Pontifical States	......	......	......	1	......	1
United States	1	......	2	......	......	3
Hawaii	......	......	1	......	......	1
Great Britain	......	2	5	3	3	13
Canada	......	......	2	......	1	3
Totals	2	23	79	124	200	428

In order to illustrate the extent of representative objects of the different kinds appropriate to Classes 89 and 90, as well as to convey an idea of their relative value in the estimation of the juries, the following

tables of the general classes of articles shown, and the number of prizes of different grades severally awarded, are also presented:

***Prizes of different grades awarded in Class* 89.**

Specifications, Class 89.	Gold medals.	Silver medals.	Bronze medals.	Honorable mentions.	Total.
Governments and founders	8	7	1	......	16
Primary normal schools	......	......	......	1	1
Plans, furniture, &c	......	1	6	16	23
Articles for infant schools	......	......	......	1	1
Educational collections	......	......	1	1	2
Hygienic and gymnastic collections	......	1	3	......	4
Religious instruction	......	......	......	3	3
Reading	......	......	3	5	8
Writing	......	......	6	15	21
Arithmetic and metrical system	......	2	3	4	9
Accounts	......	......	1	2	3
Grammar	......	......	1	3	4
Geography	......	5	3	10	18
Natural history	......	......	2	......	2
Singing	1	5	8	6	20
Design	......	......	1	6	7
Sewing	......	......	2	1	3
Authors of primary works	......	5	3	6	14
Editors	......	4	6	9	19
Blind, deaf-mutes, idiots*	1	10	7	14	32
Totals	10	40	57	103	210

Prizes of different grades awarded in Class 90.

Specifications, Class 90.	Gold medals.	Silver medals.	Bronze medals.	Honorable mentions.	Total.
Governments	......	1	2	......	3
Secondary normal institutions	......	3	......	......	3
Classes and courses for adults	5	8	5	1	19
Special schools and schools of design	2	7	6	2	14
Models and methods	......	1	4	10	15
Works of pupils	......	......	1	6	7
Special secondary instruction	1	3	5	5	15
Collections	......	......	7	13	20
Technical instruction—agriculture	1	3	3	2	9
Technical instruction—commerce	......	......	1	......	1
Technical instruction—mechanic arts	1	8	10	3	22
Technical instruction—marine	......	1	7	......	8
Libraries, societies	1	3	6	9	19
Authors of reading books	......	1	7	8	16
Authors of pedagogic works	......	......	......	4	4
Authors of classical works	......	......	......	12	12
Authors of agricultural works	......	......	1	6	7
Authors of industrial works	......	......	1	4	5
Authors of military works	......	......	......	2	2
Editors of special works	......	......	1	17	18
Totals	11	39	67	104	221

In examining the foregoing tables, it should be borne in mind, of course, that the number of prizes subject to the control of the International Jury was limited—so much so that the examining juries had constant occasion to regret their inability to signalize the importance of very many contributions as they deserve.

The attention bestowed by the public upon the educational department was, doubtless, greater, because of the profound interest awakened in all intelligent minds by the creation and imperial consecration of the group to which it belonged. The number of French teachers alone, who visited and studiously examined its displays, was over twelve thousand. From all parts of the world, zealous men and women came expressly to avail themselves of such facts, principles, suggestions, and sources of information as it afforded; while of the more than ten millions of visits made to the Exposition, from first to last, it is fair to infer that a large proportion had reference, more or less definite, to some branch of it in Park or Palace.

From the foregoing outline, some conception may be had of the comprehensiveness of the plan of this great department and of the magnitude of its direct influence, as well as of the subsequent benefits likely to grow out of it.

It was a part of the general plan of the Universal Exposition of 1867, that the various nations should send personal representatives of their leading interests, charged with the duty of studying each particular department and of reporting thereon to their respective governments.

Under this plan, at rather a late day in the progress of the Exposition, the writer was designated as the Commissioner who should investigate the educational systems, condition, and progress of the several countries represented, and make such a report upon them as the facts might warrant and the welfare of the country demand.

The task thus imposed seemed so important in character, and yet so difficult of satisfactory accomplishment, that it must have been at once declined, but for the fact that he had just completed a third tour of observation, with direct reference to a personal knowledge of the educational condition of the more enlightened nations of the world—the first, confined to Great Britain, France, Switzerland, Rhenish Germany, and Belgium; the second, limited to the United States; and the last, embracing nearly every remaining portion of the European continent—and was therefore in possession of recent information, which, if wisely sifted, and duly reported, could hardly fail to contribute somewhat to the establishment of correct ideas on the all-important subject of education in the United States.

Much valuable information on this general subject has been already diffused through the medium of able reports on European education; and numerous accounts of individual institutions and classes of institutions, by as many authors, have appeared in the newspapers and professional journals of the country; but all of these reports, and most of the special accounts, were published years ago, and are not, therefore, at this moment strictly illustrative of the various systems and institutions whereof they treat; while none of them have attempted a general survey and discussion of systems and classes, whether on the basis of a comparison of one with another, or as referred to an ideal standard suggested by the needs of our own time and country.

We still find the greatest diversity of opinion among our leading educators, even as to what is the best system for primary and secondary education; while on the subject of industrial, professional, and university education, there is, in almost every quarter, nothing better than a hopeful groping for the right way.

This last remark will sufficiently indicate the necessity for further light, as well as the scope of this report and the earnest purpose of its author, from whom, it is believed, no apology will be demanded for having, in some cases, in order to give a completeness to the survey, extended his inquiries and discussions beyond the bare exhibits.

CHAPTER II.

OUTLINE OF THE PRESENT CONDITION OF EDUCATION IN VARIOUS COUNRTIES.

THE SYSTEM AND CONDITION OF PUBLIC INSTRUCTION IN FRANCE—HOLLAND—BELGIUM—PRUSSIA—SAXONY—GRAND DUCHY OF BADEN—WURTEMBERG—BAVARIA—AUSTRIA—SWITZERLAND—SPAIN—PORTUGAL—GREECE—DENMARK—SWEDEN—NORWAY—RUSSIA—TURKEY, EGYPT, MOROCCO, HAWAII—BRAZIL—ARGENTINE REPUBLIC—GREAT BRITAIN AND IRELAND—CANADIAN PROVINCES—UNITED STATES OF AMERICA.

In order to make more intelligible the subsequent references to the different classes of educational institutions to be treated of in this report, as well as all discussions of them and the relations they sustain to each other, it seems proper, first of all, to present in concise form a general outline of the present condition of education in the various countries which, by virtue of their educational representation at the Exposition, have demanded my attention.

In pursuance of this plan, it is my purpose to present, first, the educational spirit and policy of each of the nations represented, with their general statistical results; and, secondly, the results as manifested in the condition of the several great classes of institutions everywhere recognized.

In the collection of statistics, I have necessarily depended upon the authority of others. No pains have been spared, however, in seeking the best sources of information, personal application having been made in many instances to the heads of departments themselves, and it is believed that, in general, they present a very correct showing of the state and progress of education in the countries to which they refer.

In considering the different nations, the order observed will be that of their local occurrence in the Palace of the Exposition, except as to the United States, which, for convenience, will be presented last.

FRANCE.

Since the year 1831, when the enlightened Guizot sent the no less able and distinguished Victor Cousin to Prussia to study and report upon the system of education in that country, much progress has been made by the cause of popular education in France.

Before that period, the imperial government and the subsequent royal dynasty had established and liberally supported many institutions for secondary, superior, and the highest culture; but the wants of the millions had been almost entirely ignored. The present, however, is full of activity and hope.

The French system of public instruction is all-comprehensive, embracing, alike, the highest and the lowest schools in the empire; the spirit which animates, and the power which controls and directs them, having their center at the throne, and diffusing themselves through the medium of officers of the departments, arrondissements, cantons, and communes, into which the empire is divided, thus reaching, or aiming to reach, the whole people.

The official classification of the schools for public instruction is usually: 1. primary, including all elementary and the lowest grade of normal schools; 2. secondary, comprising the royal and communal colleges, lyceums, and the second grade of normal schools; 3. superior, embracing the "academies" having "faculties" of science, letters, law, medicine, and theology, together with a single superior normal school.

The control of these several classes of institutions is vested in the imperial council of public instruction, formerly known as, and even yet constituting that theoretical body, the University of France; and consisting of the minister of public instruction, three senators, five bishops or archbishops, three councilors of state, three members of the court of appeals, eight inspectors-general, three clergymen belonging to the Lutheran, Reformed, and Jewish churches, five members of the Institute, and two heads of private educational establishments; the intention of the government being to give the various religious orders and institutions of the empire a fair representation in the school system, which is intended to fit all classes of persons for respectable citizenship. It is also worthy of note that this liberality of purpose observed in the constitution of boards, councils, and committees is traceable through all subordinate ramifications of the system.

All the members of this grand council are annually named by the Emperor; its meetings being semi-annual for the consideration of existing and amendatory regulations. There is also a council of thirty, with the minister at its head, entitled the superior council of improvement for special secondary instruction; a health commission of ten for all classes of schools; and a committee of patronage for infant schools, consisting of the archbishop of Paris, a senator, two chiefs from the staff of the minister of education, and twenty of the distinguished ladies of France.

Subordinate to the imperial council are regulations and officials not unusual in any important particular, yet usually ample and well-devised as by an authority intending to have itself felt and its results beneficial to the furtherance of the great end in view.

To insure efficient working and a faithful performance of duty by teachers in the various grades of schools, numerous inspectors are provided—eight inspectors-general for superior instruction, three for the faculty of letters, three for the faculty of science, and one for each of the faculties of law and medicine; eight inspectors-general for secondary instruction, four for letters, and four for science; four inspectors-general

for elementary instruction, and four honorary members of inspection, co-operating with each several class. There are also academy inspectors, numbering as many for all the academic districts as there are included departments. These inspectors are assisted by a rector, who is in charge of the normal and primary instruction for that district. More recently the infant schools are supposed to be under the supervision of the Empress, assisted by a number of ladies, salaried by the state, and numbering one for each academic district, which is the largest school division of the empire; and finally, there are a large number of departmental inspectors for the primary schools, amounting to one for each arrondissement, the civil division between a department and a commune, being no less than 363.

Private schools are allowed and encouraged, but instructors in these must pass the examinations required of those serving in the public schools; and the proficiency of their pupils and general school management are subject to a like oversight.

While it is obligatory upon the people to establish and maintain the required primary instruction in each commune, aid being given only when school fees and local taxes fail of sufficiency, attendance upon the schools is not obligatory.* The age at which those who do attend pass out of any public instruction of this grade is determined quite as often by the ages at which they receive their first communion in the church to which they belong as by their attainments in school knowledge. For the Catholic church, this age is twelve; and for the Lutheran, sixteen. Thirteen-fifteenths of the French population is of the communion of the church of Rome.

Religiously considered, in the administration of its school system, the government is most judicious and liberal, recognizing the equal rights, before the law, of Catholicism, Protestantism, and Judaism, the three great generic and irreconcilable religions of Western Europe. Instructions in religion are given in all public schools; but no child is obliged to receive instruction in any creed denied by the parents; and in all cases where it is practicable and desired, separate schools for the children of differing denominations are provided. There is nothing in the law either requiring or disallowing this practice, it being, as in the question of mixed or separate schools for boys and girls, left to the circumstances of the communities and the discretion of the local authorities in charge of the schools. As a rule, there seems to be a preference for separate schools for the sexes and the religious orders.

The progress making by the government in diffusing the elements of popular education among its people is noteworthy. Thus, in 1832, when this subject began to be vitalized by a real national interest, the proportion of children between the ages of seven and thirteen in the primary schools was no more than 59 to each 1,000 inhabitants. In 1847 it had reached 99.8, and in 1863 116 for the same number. With a population of 37,382,225 of the 37,510 communes of the empire, only 818

were, in 1863, without schools; but the whole number of primary, including infant schools, was 72,069, showing that the actual total of these more than met the demand of the law. To the neighboring schools of the more wealthy and populous communes, the children of some of the other communes must have been sent, as the number in attendance reached 4,720,224. Of the population named above, the children between the ages of seven and ten were 4,018,427; and of the number in attendance upon primary public instruction, just given, there were between these ages 3,143,540, leaving over 800,000 who were out of school unless receiving public, secondary, or private instruction. Of the number of schools given, 3,308 were infant schools attended by 383,859 children under seven years of age.

The material aid rendered by the government for primary instruction varies with the years, but rarely equals half the amount actually expended upon them, the remainder accruing from fees of such as are able to pay and from local and departmental taxes, which last share equally with the public treasury in making up any needed sum. The amount voted from the general fund of the empire for public instruction of all grades was, in 1867, 21,268,121 francs, ($4,253,624,) of which $2,182,820 was for primary and secondary schools; the remainder, of nearly one-half, being devoted to that superior education of which France is so justly proud, and which is as much a part of its public school scheme as are the communal and infant schools.

This education is found in the academies, one of which is located in each of the sixteen academic districts of the empire, and in those superior institutions located in greater number at Paris than at any other European capital. In all of these academies are faculties of the sciences and of letters, the instructional force of which is formed by a total of 183 chairs, rather more than one-half being for the sciences. In eleven of them are faculties of law, with 98 chairs. Theological faculties, with 42 chairs, are found in seven of them, and medical faculties, with 61 chairs, in three; in addition to which there are superior schools of pharmacy, with 19 chairs, at Paris, Montpellier, and Strasbourg, the seats of the medical academic faculties, and over twenty auxiliary medical schools, with about 10 chairs each, in the principal towns.

The state aid to these academies in 1867 was 3,828,821 francs; to the Superior Normal School of Paris, 307,610; to the College of France, 277,000; to the Imperial Institute, 615,200; to the Museum of Natural History, 592,380; to astronomical establishments, 267,260; to the School of Living Oriental Languages, with its branch at Athens, 147,300; to the Academy of Medicine, 43,700; to the School of Charts, 37,800. In addition to this splendid array of public institutions found at Paris and thus liberally fostered, the grants of the same year to the University, Imperial, and public libraries amounted to 696,000 francs; to the aid of savans and men of letters, 200,000; to the Society and Journal of Savans, scientific missions, and other subscriptions, scientific and literary,

300,000; to the encouragement of the instructional corps and to classical works, 60,000; and to the collection and publication of unedited documents relating to the history of France, 120,000.

HOLLAND.

Public instruction in Holland is divided into the usual grades, with primary schools, ordinary and superior, in one of which all private ones of this class must rank.

The scheme of organization is simple. The minister of the home department is the supreme officer in charge of this interest. The eleven provinces of the kingdom are divided into eighty-nine school districts, and these into communes, in each of which there must be a primary school in the care of a local board; and each commune of 3,000 persons has a school commission. For each district there is an overseer, who is chairman of all the commissions within his jurisdiction. At the head of the districts embraced in a given province is a provincial inspector, salaried by the state, whose duty is to superintend all the schools in his province, receive the reports of district overseers, and once a year to sit in the council of provincial inspectors, under the presidency of the minister, upon the general interests of primary schools throughout the kingdom.

Secondary instruction is provided for and looked after with an equally Dutch straightforwardness of action.

Children are admitted to these schools without distinction of creed; and while it is the avowed purpose to have primary instruction "tend to develop the reason of the young and to train them to the exercise of all the Christian and social virtues, the teacher is to abstain from teaching, doing, or permitting anything contrary to the respect due to the convictions of dissenters." In short, the teacher is expected and enjoined to cultivate the Christian virtues, but is prohibited from teaching any form of theological doctrine. Religious instruction, outside of the family, is left to the different communions, the school law favoring no one of them, though it expressly provides that "school-rooms may be used at the convenience of any of them, for the religious instruction of children attending the schools, out of school hours."

Primary schools must be in operation throughout the entire year, except during the time of recognized holidays.

The support of the primary schools, as in most countries, is required of the communes, which must also furnish them in sufficient number, the state deputies and the government being judge of that sufficiency. In the event of a commune proving unable to support the needed schools, the province in which it is found and the state share equally in meeting the expense.

The law further provides for a liberal minimum compensation to teachers, and that the communes furnish them a residence and garden.

It also fixes the maximum number of children to be placed under the care of an unaided teacher.

Attendance upon school is not obligatory; but is made practically somewhat so, by prohibiting parents from receiving relief from charitable institutions whose children have not been duly instructed in the elements of a popular education.

In 1857 Holland numbered about 2,500 primary schools, with nearly 5,000 masters and assistants, and an average attendance of 322,767 pupils. Of private schools there were nearly 1,000, and of infant schools 800, having an aggregate of 133,435 more.

An estimate of the results of these schools may be gathered in various ways outside of the school reports, which are not of very late date. In 1857 a speaker in the national legislature complained, as in evidence of a deplorable state of ignorance in that portion of the kingdom, that of the conscripts of South Holland, the worst educated portion of the kingdom, ten per cent. were unable to read and write. A parallel comparison of this with the wholly uneducated number found in the service of many a more pretentious country than old Holland would have induced more bitter complaints in the interest of humanity, or greater respect for the institutions of his own.

Commissioner Arnold, sent out by the council of education of Great Britain to investigate the school systems of certain countries, in his report of 1860 says, in speaking of that of Holland: "It is impossible to regard it without admiration. I do not think we can hope, in England, for municipalities which, like the Dutch municipalities, can be trusted to provide and watch over schools; for a population which, like the Dutch population, can be safely trusted to come to school regularly; for a government which has only to give good advice and good suggestions to be promptly obeyed."

In 1867 Holland appropriated to all its schools, of every grade, 1,605,695 florins.

In secondary, and especially in technical or industrial secondary, instruction, there is a great interest. Schools of various specialties connected with the industries of the people, embracing Sunday schools and evening classes, have been instituted in recent years and are doing much toward bettering not only the material but educational character of the laboring classes, who, from their former almost exclusive limitation to the pursuit of agriculture, and that but rudely practiced, have been the least informed and most unskilled general workmen in Europe. At the same time, the quality of their higher burgher schools, seminaries, and athenaeums for intermediate education has correspondingly advanced in the interest of letters and philosophy.

These special schools are largely supported by municipal and private means; but the state also not only encourages but aids, when needed, all such enterprises. The amount of public grants to secondary and special secondary schools and associations is about $50,000 annually.

Charitable institutions are unusual in number and well sustained. Superior education has its universities at Leyden, Groningen, and Utrecht, which, besides revenues from endowments, are fostered by both public and private means.

BELGIUM.

The school system of Belgium is very imperfect, yielding but inferior results.

As in France, the kingdom is divided into provinces, corresponding to the French departments, arrondissements, cantons, and communes. The minister of the interior performs the functions of minister of public instruction.

The law recognizes the following classes of schools:

1. Primary, including communal schools, founded, supported, and administered by the communes; private adopted schools, often a substitute for the communal, and receiving a consideration for instruction given; and private free schools, usually those of denominational orders, and which admit poor children gratuitously.
2. Superior elementary, or high schools.
3. Secondary, or intermediate schools, preparatory to the university, and known as Atheneums.
4. Normal schools, primary and secondary.
5. Superior schools—universities with faculties of philosophy, medicine, law, and theology.

The public communal schools are established and managed by the communal authorities, which are practically quite independent as to their establishment at all; though, if done, the schools are subject to the supervision of the government through cantonal inspectors appointed by the minister. It is the duty of the inspector, whose term is three years and who receives a per diem for service rendered, to visit each school within his canton twice in each year, and report to his next official superior, the provincial inspector. Of provincial inspectors there are nine; one for each province. They are appointed in like manner, with corresponding duties for their province, besides that of presiding at the cantonal conferences of teachers and making a report of the proceedings, as well as of all inferior inspectors, to the minister of education.

Once a year these provincial inspectors meet in council at Brussels, under the presidency of the minister, to consider all educational interests that may arise.

Teachers can only be appointed, upon favorable examination by a clergyman and a layman, from among candidates who have had at least two years' training in an approved normal school; and when appointed, are removable by the inspector, upon consultation with the communal council.

In the superior elementary schools, it is provided that one of the best in each province may incorporate into its scheme a course of normal in-

struction for persons fitting themselves to teach in the lower schools. Provision is made in the organization of the Atheneums for instruction in various industrial branches.

In addition to these courses, normal and industrial, separate schools are founded for higher advantages in acquiring proficiency in the art of teaching and in the application of science to the pursuits of life.

Superior education is furnished in two universities of the state, at Ghent and Liege, and two outside of government patronage, that of Louvain being Catholic, and that of Brussels liberal.

In special culture, there are schools of arts, manufactures, mines, and civil engineering, in connection with the state universities, and a superior commercial institute at Antwerp.

The policy of the government is, like some of its European neighbors, to give as little assistance as is possible to elementary instruction, and keep good the right to superintend its character and operations—that of the Belgian authorities limiting it almost within the encouragement given to communal school-house building, by loans of money to that object, returnable within a given number of years. From 1842, when the present school regulations were adopted, to 1851, there was such a decline in the public interest growing out, as it seemed, of the voluntary policy permitted in the communes, that few of them either owned or provided school buildings. At that date the government opened a credit of 1,000,000 francs with the communes in aid of school-houses, so that at this time they own some 2,500, capable of accommodating over 256,000 pupils. Still, looking at the condition of the education of the common people as favorably as possible, Belgium presents the spectacle of a militia of which scarcely over thirty per cent. can read and write, and a school population, two-thirds of which commence the labor of life in self-support without the rudiments of anything that can be called education.

Secondary and all intermediate education fares better, but is yet unsustained, in any just sense, by the public treasury. When superior and special institutions are considered in reference to the ways and means of their existence, the state shows to better advantage in the two universities of its care and those independent, giving instruction to nearly 2,000 students, while meeting more than half of the annual expenses of such schools as prepare for the higher professional positions of life.

It supports schools for the blind and deaf-mutes, for orphans, and for juvenile criminals. It liberally sustains a national observatory, about 20 public libraries, three conservatories of music, with more than 1,000 pupils incited to excellence by liberal rewards, and more than 50 schools and halls for drawing, painting, sculpture, and architecture, which together instruct scarcely less than 10,000 students, all of which institutions are aided or supported by public funds.

PRUSSIA.

First among the nations to adopt systematic regulations for the instruction of the people, and faithful to this policy through the strifes and upheavals of more than three hundred years, Prussia is fully entitled to its present rank as first in the educational world.

Owing to the war of 1866, and the absorption, as a consequence, into the kingdom of a number of the smaller states of North Germany, the school system of Prussia is undergoing modifications. At the date of this writing, however, none of these have been promulgated, even if determined upon, and this account must be understood, therefore, as referring to the period immediately preceding that great event.

The principal divisions are provinces, of which, in 1866, there were ten, and these are subdivided into regencies, circles, and parishes.

Its system of public instruction wears the features of a strong government. At its head stands the minister of education and of ecclesiastical and medical affairs, and a central council, of which he is president. This council is divided into sections corresponding to the three general interests of the department; the one devoted to the establishment and care of schools being the educational cabinet of the minister, and occupied in devising plans and executing such measures as meet with his approval and have the sanction of the law.

Next below is the provincial council, having general control of secondary education, and primary normal schools. A subdivision of this consistory (*Schulcollegium*) has charge of the primary schools of its province, being empowered to execute the statutes made and provided, and to decide upon the use of text-books, subject to the approval of the minister, to whom all its transactions are reported.

Immediately below this is the church and school section of the supreme council of the regency, charged with the examination and appointment of teachers in the primary schools, with keeping the schools in good condition, and with collecting and disbursing school funds. It is presided over by the school councilor, (*Schulrath*,) who is a member of the regency council, and entitled to a seat in the consistory of a provincial council, to which, on behalf of the church and school committee, he makes report.

The educational officials of a circle are the councilor of the circle (*Landrath*) and the inspector, a clergyman, whose duty to watch over the schools of the several parishes of his circle is an essential part of his ecclesiastical functions. Finally, each parish must have its school, and each school its committee of supervision, (*Schulvorstand*,) consisting of the curate, two magistrates, from two to four notable persons of the parish, and its inspector, usually the parish clergyman.

In the larger towns and cities the general management of all the schools is intrusted to a board called the school deputation. This board consists of the burgomaster, (mayor,) members of the municipal council,

pastors, and directors of the higher schools, while there is also a committee of management for each school.

Each of the heads of council, from the highest to the lowest civil division of the country, is appointed by the government, and each has the power of veto over the acts of the council, board, or committee over which he presides, and, in certain cases, over the appointing or elective school privileges of the people. Thus the entire school system is in the hands of the central power at Berlin.

The schools rise in gradation in the following order: Elementary, lower burgher, higher burgher, real, pro-gymnasia, gymnasia, and universities. There are, besides these, normal schools of the three grades, and a great variety of special schools devoted to instruction in the practical arts, in the application of science to industry, in liberal professions, and in the fine arts.

Religious instruction is an invariable rule, though the state expressly provides that "children whom the law allows to be brought up in any other religion than that which is being taught in the public schools, cannot be compelled to attend the religious instruction given in the same." The latest regulations upon this subject (1851) are to the effect that, "in the people's school all possible regard shall be had to denominational relations, and religious instruction left to the conduct of the respective religious bodies." As a rule, where Protestants and Catholics are each in sufficient number to render it practicable, separate schools are established. Any parish, however, may have a mixed school, if there is general agreement to do so, and the authorities concur. Most of the public schools are open to all children of proper age and qualifications, without respect to sex.

In regard to support of schools, each parish must maintain its own, if able, and being unequal to the charge, the circle, the province, and the state join equally in meeting the expense.

Provision is made for teachers in exemption from military duty during their studies, preparatory for and when engaged in instructional service, if, in the opinion of the authorities, they cannot be spared from their work; also, for compensation while thus employed, and for support when no longer able to serve. The number of pupils that may be placed under the care of one instructor is always regulated by law.

While attendance is strictly obligatory upon the schools provided during school age, from seven to fourteen—unless by special permission—parents furnishing instruction in other ways are not released from support of the public institutions. To increase the necessity for the education of children whom poverty or the avarice of parents might tempt to place at work, to the neglect of school opportunities, the law prohibits, by severe penalties, the employment of any person under sixteen years of age, unless satisfied by certificate from the school authorities that he has a knowledge of the required rudimentary branches of education. Exceptions are made in cases where an employer of large numbers of

young persons maintains a good school, at his own expense, for the instruction of his employés during a certain number of hours each day; and a default to furnish any child in such employ this opportunity, three times in five years, forfeits to the employer the right to forever after engage in his service any under that age.

The Prussian government, while dispensing from its general funds only so much as is needed to make good the deficit in local taxes and school fees for primary instruction, does yet, by its school enactments and liberality, so keep equal to their demand the great body of its people, that all ranks and denominations seem to have a common pride in the maintenance of their position as leaders of popular education. And since the people are the basis of all financial possibilities within the dispensation of public authorities, their readiness to contribute to all classes of secondary, special, and superior schools must be equally great, since, besides its nearly 25,000 common schools, with an attendance of about 3,000,000 children, Prussia presents an array of institutions of the higher and highest rank no less honorable to its liberality and wisdom. No enumeration of these will be made here, as in the body of this report there will be frequent occasion to refer to them in illustration of the grades under discussion. In no country in the world, however, is the public outlay of means for schools of all classes more liberally responded to by the popular, voluntary purse—a standing argument against the few who undertake to make it appear that the people who are compelled to have elementary education do not value it, or make haste to add to it; and a perpetual memorial to other nations in favor of popular school instruction.

SAXONY.

The systems of public instruction in the other states of North Germany differ so little in their main points from that of Prussia, from which they have been largely borrowed, that special accounts of them, save of Saxony, are deemed unnecessary. Indeed, the system of this excepted state is not materially different in other respects than that of a most admirable adaptation to the needs of a smaller kingdom.

Aside from this, and perhaps as the best reason that could be assigned in favor of a special notice, is the highly important and honorable position so long occupied by this little kingdom in the educational world; and all the more is this due, since it is the last time its distinct existence, as a kingdom, can be chronicled.

Before its incorporation with the body politic of Prussia, growing out of the war of 1866, and with a population little over 2,000,000, ninety-eight per cent. Protestant, it had of primary schools, equal to any in the world, 1,974, with a corps of 3,589 teachers, and 331,854 pupils—the school attendance from six to fourteen years of age.

The schools of secondary, special, and superior grade embraced a uni-

versity and a polytechnic institution, and one, each, of scientific research, mines, forests, the arts and trades, surgery, military, artillery, cadets, and normal, for training teachers of gymnastics. It had 9 superior normal schools, 5 of architecture, 5 of commerce, 7 real schools, 25 gymnasiums, 4 of weaving, 25 of lace-making, and schools for the blind and deaf-mutes.

The great university of Leipsic, and the world-envied gallery of paintings at Dresden, will be spoken of as the possessions of Saxony long after the obliteration of its distinct political existence has ceased to remind of its former rank among the proud old states of Europe.

THE GRAND DUCHY OF BADEN.

The people of Southern Germany have characteristics distinguishing them from those of the northern states, and modifying their school systems.

The great divisions of Baden are into four circles, these into 74 bailiwicks and again into 1,595 communes.

The old system of public instruction, which was harassed by a multiplicity of religious questions, was thoroughly revised and readopted in 1864; but owing to the liberal spirit with which the new code treated the subject of religious control of the schools, the clergy made violent opposition to its practical adoption. In this crisis the Grand Duke, Frederic III, honored his administration, and conferred lasting benefits upon the cause of education, by a maintenance of constitutional rights; and from that time the operation of the system has brought most desirable results.

The main points of the law are these: The executive administration of the minister of the interior, aided by a council of one from each circle. The immediate charge of the primary schools, which are of two grades, (simple and superior,) is in the priest or pastor of the commune, the mayor, or a member of the municipal council, and the teacher, as ex officios; to which is added a number greater than these, elected from the people by the school patrons. In the larger communes the physician and rabbi are added to the ex officios. This council appoints inspectors, who visit each school once in three months; while for the district, in place of the former inspector, who was priest or pastor, the government provides and salaries inspectors who may not, during the time of such service, engage in any other employment, and who are well qualified for their position.

Teachers in these schools must first graduate from a normal institution, and, after passing a rigid examination, serve three years as assistant in a public school before passing a final examination, and then, only, upon receiving the verdict of "very capable," can he secure the position of teacher in charge of a primary school of even the lowest grade.

The character of these schools, which, for a population of less than 1,500,000, numbered, in 1867, 2,157, may be judged from the prescribed

course of instruction in the simple, or very first of the elementary, class. The studies pursued are religion, German, arithmetic, geometry, natural history, history and geography, natural philosophy, writing, drawing, singing, gymnastics, and needle-work. In the superior primary schools the same branches are taught and advanced, with the addition of the history of the constitutional institutions of the country and the elements of the French language.

With this most broadly laid basis for an elementary instruction, obligatory, or its equivalent, upon all, and its polytechnic institution of Carlsruhe, in some respects the most remarkable of its kind in the world, for special professional culture in scientific directions, Baden presents, moreover, schools of almost all other classes worthy of its enterprise and growing enlightenment in education and the interests thereby advanced.

WURTEMBERG.

Foremost among the German states to adopt a liberal and thorough policy of public instruction, the little kingdom of Wurtemberg still holds honorable rank.

Elementary education was made obligatory as early as 1810, and has been confirmed by subsequent legislations of 1824 and 1864.

The administration and care of schools are much the same as for other German states. With the home minister at its head, there are circle superintendents of co-ordinate powers from each of the three great religious orders, for secondary schools; inspectors of common schools; directors of teachers' conferences; and last, the communal councils elected by the patrons, and with presiding officers appointed by the King, and committees of citizens for the assessment of school taxes.

The several denominations are upon equal footing in all school privileges, and separate schools may be established at the expense of the whole community, when it is desired by sixty families of a given denomination.

The law requires every community of thirty families to have a primary school. In case the number is less than that, except under circumstances of isolation and peculiar embarrassment of locality, as small a community as fifteen families may have a school decreed them; or, if more convenient, so small a number may unite with the nearest established school.

Those aspiring to the office of teacher must give notice of the intention of following that pursuit, and after two years' preparation for a course of normal instruction, to which they are not admitted until seventeen years of age, must here complete a three years' course under an excellent master; and then, having served two years as an assistant in an approved public school, may stand the chance of passing examinations that admit them to the honor of teacher in charge of an elementary school. Here, as in many of the European states, the guardianship of

the office of the teacher is most excellent, and worthy of the consideration of all who are interested in the proper training of children.

The normal schools of this kingdom are of a superior quality, even for the usually fair grade of this class in other countries, with tuition entirely free, and assistance, in the way of board, for the candidates who are poor but promise well for the office of teacher.

As before stated, attendance is compulsory, and neglect of parents to comply with the terms of the law is visited first with fine and then with imprisonment; and, in the failure of these, the school police may take such charge of the children themselves as will bring them into school. If ill health does not permit attendance, and the child is yet able to study at home, and the parents are unable to supply it with instruction there, the school authorities may provide it at communal or state expense, as the contingencies of the case may demand.

So rigid is the government in the determination of making the results of the school law good in spirit as well as letter, that provision is made for requiring the attendance of pupils one and two years longer than the prescribed age, in the event of their not being able to pass a final examination of creditable scholarship in the courses that have been pursued. To this is added the enforced attendance upon some Sunday-school, after leaving the primary, until the eighteenth year, unless the child is, during that time, under instruction in some school of higher grade.

Further, no child is allowed to learn any trade, or enter any occupation, or to receive pay in any service whatever, who cannot show a certificate from the authorities of having answered the demands of the school law.

The primary schools, as in Baden, are of two grades, the courses pursued embracing about the same branches, the number of which schools, for this small kingdom of a little more than 1,500,000 souls, is about 15,000.

At the head of its superior education stands the old University of Tubingen, with extensive botanical gardens and anatomical collections, a library of 60,000 volumes, 6 faculties, and 1,200 students.

Between these, besides an unusually large number of denominational and independent schools and seminaries, there are more than 50 real-schools of the first and second grade; 6 Latin schools; 7 gymnasiums; of normal schools, agriculture, and philosophy, each, 3; 6 lyceums; of schools of commerce, forestry, architecture, polytechnics, and the fine arts, each, one.

As in the republic of the Alpine Mountains, with its wide-awake little cantons, each vying with the other in developing the intellectual resources of its people, or as among the sturdy Dutchmen of the sands rescued from the sea, one is tempted to pause on the threshold of this comparatively unimportant territory in contemplation of the real importance of each individual and communal effort in the furtherance of any great humanitarian work.

BAVARIA.

With a population of over 4,500,000, the Catholic majority of which exceeds by about 2,500,000 all other denominations, Bavaria has an exceedingly thorough and liberal system of public instruction founded upon the largest religious toleration.

The school divisions of the kingdom, its administration, care, support, together with regulations for qualifying teachers, attendance, &c., are not materially different from those of other German states.

The primary schools may be either mixed or separate, denominationally considered, under provisions based upon the expressed wish of a given number of families; and when mixed, the required religious instruction is imparted by the pastor of each sect represented by the pupils.

Even when, by permission, parents provide private instruction for their children, or when these are in attendance upon any other than the public institutions, all such pupils are required to attend, once in each year, upon the examinations held for those under care of the state, that, in no case, so far as can be ascertained, a child may pass beyond the school age without the average of elementary school attainments. Upon attaining the sixteenth year, whether from home, private, or public instruction, each girl and boy, without regard to rank in life, must have a certificate of such attainments as the law prescribes, or go into life barred of all such opportunities of occupation and remuneration as would otherwise be possible.

The figures of latest reports show a very efficient state of the primary and a more than creditable status of other schools; every primary school by law, and many others by choice, having a garden attached for the practical instruction of pupils in the growth and care of trees and plants.

In the catalogue of schools between the primary and the universities, of which there are several, a decided prominence is given in number and character to such as relate to the trades and arts, and to the fine arts; Munich being the capital, and standing in the relation of art *alma mater* to the other German states.

Pecuniarily, besides fees from parents, a local and provincial tax, the schools for primary instruction are on the basis of a generous state budget, and the government aid to all classes of schools needing assistance is of a most commendable liberality.

In view of such a state of things there is no danger in predicting that, ere long, the five per cent. of its people unable to read and write will be very speedily reduced to not one in all the land.

AUSTRIA.

A statement of the number and classes of schools found within the Austrian empire would give evidence of a satisfactory condition of education in that county. Besides the eight universities of its superior

instruction, there are 65 lyceums of philosophy; 2,138 gymnasiums; a number of professional and technical schools, and of lower, secondary, and primary almost enough to make a school, of some sort, for each parish. But where there is a spirit of national interest, and a really efficient working in the public school system of a country, there will not be found any difficulty in procuring its records and statistical reports. Such reports, with the freshness and accuracy of a people awake to so great an interest, could not be found. Again, it must not be forgotten that the schools now established suffice for a population of 36,000,000.

Justice to the liberal spirit, both in and outside of the government, demands, however, that there be taken into the account of its present condition the difficulties with which it has to contend in establishing anything like a national system of public instruction. Principal among these are the great diversity of its populations, with no homogeneous principle of unity among them, and the powers of a church and an aristocracy, both averse to the liberal diffusion of knowledge among the masses of the people. These, like an incubus of great darkness, have rested for generations upon the vast possibilities of its intellectual development.

In view of all the circumstances, the actual number and grades of such schools as do exist are creditable to the government.

The general system of organization embraces a council, superior and subordinate, of superintendence and inspection, in which the civil and church authorities are of equal numbers and powers, the whole under the control of the minister of education.

The classification of schools is similar to that of Prussia, though the inferior primary schools are quite below, and the superior ones much less numerous, and all less efficiently managed than those of its enterprising neighbor.

The qualification of teachers and school attendance are so loosely provided for, and so little looked after, that the average actually in school, from seven to twelve years—the Austrian school age—is but little over fifty per cent. for the whole empire. In the German provinces, where the people come more directly under the influence of a liberal culture of other people, the statistics show, in a population of 12,000,000, a superior, grade of higher schools, and of primary 11,158, with a boardof instruction numbering 17,853, and an attendance of 1,645,816 children, making a per cent. of the school population of, for different portions and years, eighty-six and ninety-four.

In 1864 the municipal council of Vienna made a step in advance of any portion of the kingdom by establishing in each of the eight parishes of the city a superior *Bürgerschule*, (citizens' school;) and later, by memorializing the council of public instruction, to the end of securing to their national system the efficiency of that of Prussia.

While considering the ways and means of providing for such changes as were involved, the Austria-Prussian war of 1866 seemed to delay so

desirable an accomplishment; but the more immediate contact of the less cultivated Austrian soldiery with the better educated and victorious Prussians, and the fact that not only their own government, but the intelligence of all civilized peoples, attribute the advantage of the latter to the more thorough mental discipline acquired in their schools over that of the comparatively uneducated enemy, are telling with more certainty than human prescience could have predicted upon the Austrian demand for a better popular education.

SWITZERLAND.

The Swiss system of popular education possesses peculiar interest to the people of the United States, owing to the general resemblance it bears to our own. There is, in fact, no national system, each cantonal division of the republic, of which there are twenty-five, having its own system complete.

An account of these, in detail, would be neither profitable nor practicable, and a mere outline will be given of what, for the want of a more fitting term, may be called the school system of Switzerland.

The spirit of this system is at once Christian and democratic. Its administration rests primarily in the cantonal minister of public instructions, with shared or delegated aid from a board made up of three or more members elected from the communes, or sections, which are the only school divisions known to the cantons. These communal directors are, one for each, elected by the people to look after the school of its locality, and furnish, at discretion of the minister, a board, of such as he may select therefrom, to co-operate with him for the general good of the entire canton, which answers substantially, for the purposes under consideration, to the State of our federal Union.

The gradation of the schools is essentially German; and for the inspection there is a plan adopted similar to that noticed in several other countries—the communal inspectors reporting to the cantonal, and these to the minister, in regard to whatever relates to the fulfillment or evasion of the law and the general condition of the schools.

The provisions for securing good teachers are admirable, and in evidence that it is far enough from either the theory or practice of the Swiss citizen to consider a poor teacher as better than none, or a better teacher, at advanced pay, more expensive than one less qualified at a cheaper rate.

Attendance is obligatory in most of the cantons unless it can be shown that children not in the public schools are receiving equally good instruction in private schools or at home; and even then, so jealous is the state in its guardianship of this great interest, children having instruction outside of the public schools must undergo examinations to ascertain whether their proficiency equals that demanded by the system publicly administered. In some of the cantons the prescribed school age is from seven to fourteen, and in others from six to sixteen.

Notwithstanding this generally enforced acceptance of the instruction provided, there is a large margin in the construction of the law as to the length of the school year, and provision made for allowed discontinuance, after the twelfth year, of such children as are very inconveniently situated, or who are a necessity to poor and infirm parents.

The policy in regard to the support of the schools is much the same as that in Germany, and a general interest is maintained in them as vital to both individual and national prosperity. Whether their children attend these schools or not, all persons liable to taxation contribute to their maintenance; and eight days before each annual commencement, a copy of the school law is sent to every person interested in its observance.

The gymnastic and military exercises connected with the public schools form a very interesting feature, and help to keep good the popular enthusiasm in regard to them. So much importance does the government attach to this branch of the public instruction that it sends each year, at its own expense, suitable young men to the great gymnastic establishment at Dresden, to qualify themselves to teach the best practices of the world in their own institutions. The skill of improvement and adaptation to their home needs, with which these "best practices" of other countries are adopted, has often been noticed by foreigners, and from a distinguished French school commissioner brought the statement, "that Germany might well send, in its turn, some of its best subjects to study gymnastics in the cantonal schools of Switzerland."

The results of the school systems of the several cantons are so satisfactory to the republic, and so interesting in some of the separate states, that there is a strong temptation to give a few of them in detail.

In Bern, the largest canton of the confederacy, there is a population of less than 500,000. Here we find 1 university, 2 cantonal schools, 1 real (practical) school, 2 for deaf-mutes, 6 normal schools, 5 pro-gymnasia, 30 high schools, 144 private institutions, and 1,393 primary schools, with a school budget of $185,851, usually a very small portion of the real expenditure of the Swiss schools.

In Zug, the smallest of the cantons, with a population of less than 2,000 inhabitants, there are 1 gymnasium, 1 superior school for girls, 2 normal schools, 3 Latin schools, 5 high schools, 5 private schools, 12 schools of improvement, and 45 primary schools, with a budget of $10,133. Of this canton Mr. Baudouin says: "Of all the cantons, Zug is that one which most glories in developing and improving its system of elementary instruction, all parts of which are closely linked, from the A B C of the infant school to the university and the polytechnic school at Zurich."

In Zurich, with scarcely more than 250,000 of population, besides having the honor of possessing the great university and the polytechnic school for the confederacy, and the usual array of normal and high schools, and schools for the unfortunate, we find no less than 514 primary schools,

about 75 classical, and 320 schools of labor, giving instruction to nearly 10,000 of such as, while they must learn to work, may still learn to think.

One cause of the efficiency of public action in the cantons of confederate Switzerland ought not to be overlooked. While the population of the country is of diverse nationalities and represents extremes of devotion in the great classes of religionists—Catholic, Protestant, and liberal—it has been the policy of the several governments to tolerate all religious beliefs; nay, to treat all alike generously, but, at the same time, to enforce the duty of public instruction, notwithstanding the opposition of any sect. In this work Switzerland has had a fair amount of hinderance, but in evidence of the independence of the state in this regard may be cited a resolution, passed in 1867 by the grand council of Bern, the substance of which sets forth, "that the absolute obedience which members of religious orders owe to their superiors being found incompatible with legal requirements concerning instruction, no persons belonging to such orders shall henceforth be employed upon the public educational staff, and that all such persons now employed are to be considered as having resigned."

SPAIN.

One of the first European states to establish great universities in the Middle Ages, and for subsequent centuries the nurse of science as well as the "cradle of great captains," for the past hundred of years Spain has so lagged in the great march of the nations that the world has well-nigh lost all hope of seeing her ever awake and put on new energy for the fulfillment of a mission more in harmony with the spirit of modern times; but the past few years have shown that she has not yet gone into hopeless decay—that she too has shared in the educational impulse destined to reach every portion of the earth, and is now determined to advance to an honorable position among the more progressive and enlightened nations.

Public education in Spain is under the general direction of the minister of public works, commerce, and instruction, and a royal council—embracing six sections, to wit, primary instruction, philosophy, ecclesiastical science, jurisprudence, medical science, and administration of public instruction.

The general division of instruction is into primary, which is gratuitous and obligatory by law; secondary, which includes the colleges and all institutions of like character and grade; superior, or faculty education, which embraces the university courses; and professional, which is given in the special schools for music, painting, sculpture, and architecture, bridges and highways, forests, arts and trades, &c. The clergy, which has its courses and theological faculties in the universities, has, besides these, over sixty episcopal seminaries, in which there is a wide range of studies, leading from the Latin grammar up to the doctorate. In 1864 these ecclesiastical colleges numbered 23,614 pupils.

In presenting the extensive and highly interesting collections destined to have place in Classes 89 and 90 of the Exposition, the Royal Commissioners for Spain made the following very encouraging statements:

"Within the past few years primary instruction in Spain has had considerable development, in consequence of the many encouragements that have been given to this interest by the government and of the sacrifices imposed upon themselves by the municipalities. In fact, the expenses incurred for the *personnel* and *matériel* of the schools amount to a third of their budgets. Since the publication of the law of the 9th of September, 1857, which regulated the pay of teachers, and fixed the proportion that each center of population should pay, according to the number of inhabitants, in aid of primary education, the number of schools has increased prodigiously, and has even doubled within the last ten years. We can certify that now there is not a single hamlet that has not its teacher and the necessary resources for the maintenance of one school for each of the two sexes. If we add, moreover, that this same law has rendered primary instruction obligatory, in granting to judges the power to condemn to a penalty, the extent of which varies according to the offense, all parents who do not send their children, between the ages of six and nine years, to the schools, we shall have the explanation of why the schools have multiplied in so short a time and the number of pupils reached a very considerable figure; also the ground of our hope that in a few years Spain will, in this respect, have nothing to envy the most civilized nations of Europe.

"This result, so satisfactory, has been obtained also through the creation of normal schools, which have been improved by successive special regulations, and which each year furnish the necessary number of teachers of every grade. These schools have also facilitated among all classes of society the means of acquiring those primary ideas which are the basis of more extensive information in every department of knowledge. On the other hand, the provincial inspectors have rendered important service since the date of the creation of that office, whether in stimulating the zeal of municipalities for the establishment of new schools or in inciting teachers to give instruction as extended as the faculties of their pupils and the circumstances of the locality will permit."

The objects exposed in the educational classes of Group X embrace every department of primary instruction, together with a great number of popular scientific and other works designed for a wider diffusion of knowledge among all classes of the people, and, in the aggregate, were a most welcome indorsement of these words of the Royal Commission, as well as additional warrant for the reference I have myself made to the future of education in Spain.

PORTUGAL.

Public education is even more backward in Portugal than it was in Spain twenty years ago.

The schools are primary, secondary, (chiefly lyceums,) and superior,

(including all above secondary.) These interests are under the direction of the minister of the home department and a royal council.

The regulations in regard to teachers and the obligatory education of children are fair in letter, but none of them are enforced with spirit and energy, so that the number of schools, and of children in attendance upon such inferior ones as do exist, is lamentably small.

GREECE.

It is not possible to think of the past glory and present wretchedness of Greece without sad reflections upon the transitory nature of even national eminence.

Greece, once the intellectual mistress of the world, adorning its civilization with the triumphs of her genius in every department of art, science, literature, and philosophy, to-day a feeble community, ranking but as a petty kingdom, and that only by the grace of nations having no existence in the days of her ancient glory!

But there are still sparks of living fire in the embers of her departed greatness, and we find her, through representative lovers of learning, demanding a place for educational contributions in the Universal Exposition of 1867.

Under the system of instruction inaugurated within the past quarter of a century, no little progress has been made in diffusing the blessings of education among all classes of the people. Over 50,000 children are now in the primary schools, over 5,000 in the Hellenic, (a secondary school based upon the study of Greek,) some 2,000 in the gymnasiums, over 600 in the University of Athens, and a considerable and yearly increasing number in the normal, industrial, scientific, and professional institutions.

DENMARK.

The Scandinavian states have long been noted for the excellence of their common schools and the universality of rudimentary education among the people.

In Denmark popular education has been provided for and fostered by the government for more than three hundred years. Under the law, operative since 1814, the general control of this interest is in the hands of a minister of public instruction and subordinate superintendents for the several departments of the kingdom.

Each parish is obliged to furnish good primary-school buildings, with teachers for the instruction of children in reading, writing, arithmetic, the Lutheran Catechism, grammar, history, and geography. There are normal schools for the training of teachers, which add to these more primary branches studies in mathematics, the natural sciences, pedagogy, gymnastics, drawing, and music.

The secondary schools are high or grammar schools, and furnish instruction in the Danish language and literature, in Latin, Greek,

French, and German, and advanced courses in mathematics, the natural sciences, &c., and are found only in larger towns and cities—about thirty in number for the entire country.

The schools are well managed, and bring corresponding results, the profession of schoolmaster being honored and education valued.

Schools of superior rank are liberally sustained and patronized, the income of the University of Copenhagen reaching to nearly $75,000, with an attendance of students there and at the University of Kiel, which has an income of about half as much, and libraries embracing 175,000 volumes.

In special education, there are schools polytechnic, military, naval, of forestry, and medicine, an academy of the fine arts, and those usual for the unfortunate.

From the first movements of the state in the direction of popular education, it was compulsory, to the extent that the church refused confirmation—without which no person could be employed, apprenticed, or married—to such as could not read and write; and under the present law it is unconditionally imposed upon all parents that their children shall receive instruction in some approved school from seven to fourteen years of age, and the law is respected and effective.

SWEDEN.

The government of Sweden nobly began the work of popular education almost two hundred years ago, demanding of every youth who would be confirmed by the church—without which the royal road to marriage and all the avenues of success in life were closed to him—that he should show that he was able to read and write. The result of this intelligent and thorough educational policy, well followed up by the adoption of improved systems, is that at the present time, while occupying an inhospitable and half barren country reaching north to the Polar Sea, Sweden probably has as small a per cent. of persons within its borders who cannot read and write as any country in the world.

The Swedish system embraces the usual classes of schools, the primary being mainly under the control of the clergy, who are of the Lutheran faith. To each diocesan consistory, having care of all the schools within its ecclesiastical jurisdiction, inspectors appointed by the state have, more recently, been added, the improved condition of which testifies to the advantage secured.

The law of 1864 required the establishment of a school in each parish; but the sparseness of the population in portions of the country rendered the law, of necessity, inoperative, and the authorities fell back upon the perambulatory system that had been so successful in Norway. There are at this time more than 16,000 of these itinerant schools held for a few weeks, or for a few days in each week, in given localities, and furnishing instruction to about 125,000 pupils.

In the more thickly settled portions of the kingdom the parishes are

divided into districts, each having its permanent school, the whole number of which is over 2,000, with 150,000 in attendance; in the higher public schools are 6,000; in private schools, 20,000; 150,000 educated at home—making a total of nearly 500,000 receiving public primary instruction, or some education of equal value.

The quality of the culture secured at these schools may be judged from the studies pursued in the most elementary of them, and everywhere advanced and improved upon in the permanent schools of towns. These studies are religion, the Swedish language, geography, mathematics, Swedish and general history, natural history, writing, music, drawing, and gymnastics.

The legal minimum compensation of a teacher is not so much money, but an amount of the necessaries of life, such as corn, firewood, pasture, a garden, a house, &c. If a faithful teacher and well liked, he may expect to, and usually does, receive more from the school patrons; but this much he is guaranteed, and in case of failure in the school district to meet his needs, the government comes to his aid.

Attendance upon the schools is obligatory between the ages of nine and fifteen.

Secondary education is given in schools of learning—corresponding to the pro-gymnasia of Germany and grammar schools of England—gymnasia, and apologist schools. The first two afford instruction in the higher mathematics, Greek, Latin, German, and French, and are preparatory to the university. The apologist schools teach the same, with less of the classics, and answer more nearly to the real schools of Germany.

Normal and special instruction can be had, to a considerable extent, in its 8 normal schools, 1 school of agriculture, 2 horticultural schools, 7 schools of forestry, 9 schools for the arts and trades, 1 for naval construction, 9 for navigation, and an extensive polytechnic school.

Superior education still flourishes in its two ancient universities of Lund and Upsala, with their 77 professors and 1,500 students.

NORWAY.

Although a portion only of a kingdom, Norway, by its heroic efforts, under adverse circumstances, to educate all its children, deserves an independent place in the educational review of nations.

Owing to the non-existence of facilities for the prosecution of the trades, its population is mainly agricultural. It is also so sparsely peopled for the area occupied—not much more than one acre in one hundred being of any practical value under cultivation—that the maintenance of permanent schools is not attempted. Accordingly, while each parish is provided with a school-house or a school-room, the schools of great sections of the country are occasional blessings, coming only at certain months of the year or specified days of the week, the teacher passing like a missionary from one school to another. There are in Norway

about 200 of these traveling schoolmasters, carrying the bread of knowl edge to 150,000 children of that sterile land.

Of permanent district schools there are some 200, educating an average of 20,000, and over 60 schools accommodating their instruction to the wants of 7,000 laborers.

In the towns, besides excellent common schools, there are between twenty and thirty high schools, for the better education of the children of the middle classes, though open to all who seek them.

In the principal towns are colleges for preparation for the university at Christiania, with its time-honored character, its 30 professors, and its 1,000 students.

Many of the special schools and the usual range of charitable institutions are found here, and are well sustained.

The law enforces the establishment, and by some means the maintenance, of schools for the education of all its children; it sees that the children are in the schools when established, and that they have appropriate courses of study and faithful instructors. To this end but little aid is given directly by the state, and yet, with a resoluteness worthy of all honor, the sturdy Norsemen manage somehow to command the means, and accomplish the acceptance of their use to the universal education of their children.

RUSSIA.

This grand empire is making no less rapid strides in educational matters, under the enlightened policy of the present Emperor, than in the development of its vast resources and the general amelioration of the political and social condition of its population.

Since the foundation laid for intellectual culture by Peter the Great, universities and other institutions of a high order have had an existence in several of the larger cities. So long, however, as a large majority of the people were slaves, and it was the policy of the government to keep them so, scarcely anything was done for the establishment of a grade of schools lower than professional and gymnasia—such as were essential to the education of the nobility, and to qualify the few for different branches of the civil service. But the shackles of serfdom were no sooner knocked off than the people began to call for schools. Even the late serfs undertook, of themselves, in many instances, the work of establishing them; so that, while in 1861 there was scarcely a public school for the peasantry in the empire, at the close of the second year of their emancipation 8,000 schools had sprung up, all of them for and supported by this class of persons.

The government, also, recognizing the necessity of education for the people, has adopted measures for the multiplication of schools of every grade. Nor has the educational movement stopped here. The church has awakened to this great interest, and is more actively enlisted in the

cause of education than ever before, so that the schools supported by the church alone furnish instruction to nearly or quite 350,000 children, and the total number of pupils under instruction in the whole empire has advanced since the date of emancipation from less than half to more than a million, increasing the proportion of children in school from one in one hundred and fifty to one in sixty for the entire population.

Just previous to 1864 the budget of the minister of public instruction had grown to 950,000 rubles, of about seventy-five cents each. In 1864 the Emperor had determined to establish many new parish or village schools, and, accordingly, 450,000 rubles more were added, making the total of that year for his department (the military, naval, engineering, and other like schools being under the universities) of 1,300,000 rubles. In 1865 the public aid to education had increased to 6,467,452 rubles. It should be borne in mind, however, that a large proportion of these sums was for secondary and superior schools—the parish schools for elementary instruction being carried on, as in other European countries, with but little help from the state.

The school division of the empire is into great circles, (ten,) provinces, districts, and villages or parishes. It was the original intention to have at least one university at the chief city of each circle, a gymnasium at the capital of each province, a lower secondary school in each district, and a primary school for every parish, the officers of the university circle to have general supervision of the schools of the three subordinate grades.

In the departments of secondary, superior, and special education so much of this plan has been realized that Russia now possesses seven well established universities, with a total of 600 professors and 6,000 students; one superior normal school at the capital and several of lesser rank; three lyceums; over 90 gymnasia; about 500 district schools, (equal to American high schools;) some 70 theological seminaries; law schools apart from the universities; independent schools of medicine, surgery, and pharmacy; two or three schools of high order for instruction in the oriental languages, with over 1,000 pupils; two academies of the fine arts, with schools of art, instructing more than 1,000 students; a normal agricultural institute, and nearly 100 agricultural schools of various grades; an imperial school of mines, with 10 district and 70 primary mining schools scattered over the empire; one central and several subordinate polytechnic schools; 15 schools relating to naval and marine affairs; two schools of engineering; numerous technological institutes and industrial schools; together with general and special libraries, and a rapidly increasing number of scientific, literary, and industrial societies of almost every class known in the world.

At the present rate of its educational development, it cannot be many years before Russia will be entitled to rank among the most enlightened as well as the most powerful of nations.

ITALY.

In common school education, Italy finds herself in the same category with Spain, though far ahead of that country in the condition of science, letters, and art, as well as in the number of her institutions of higher learning, and in the multitude of her learned men. With all the glory that belongs to her as the nursing mother, for more than twenty centuries, of letters, of jurisprudence, of medical science, and of physics, as well as of art, the masses of the people are still in darkness. But Italy, too, has once more felt the electric touch of liberty, and to-day her educational Cavours, Victor Emanuels, and Garibaldis, with "Free and Universal Education" as their watchword, are now waging a war against ignorance and intolerance that must drive them, ere many years, from that beautiful and classic land.

The first efforts for the improvement of the instruction of the people began in Tuscany and Lombardy, under the stimulation and direction of Lambruschini, Thouar, and other distinguished educationists, through the medium of the journal of education known as the "Guida dell' Educatore," and quickly followed by the publication of valuable text-books for the schools, were not only successful in the provinces where they originated but extended themselves into other portions of northern Italy. But this was about the time of the enthusiasm awakened in many parts of Europe by the introduction of the Lancasterian method of teaching; and after a most extraordinary multiplication of blocks, charts, and other appliances for the schools that were exceedingly faulty, the work of progress lapsed, leaving the whole field of education in a fog of uncertainty as to means and methods; so that the present work of sifting methods and wisely directing the new movement, to be done by the educational leaders of Italy, is even more difficult than the pioneer work of their predecessors.

On this head, the author of "L'Italié Économique," in 1867, published by authority of the royal commission representing that kingdom at the Exposition, makes the following remarks: "At this moment, schools, books, methods, and instruments multiply themselves; but, it is necessary to say, without order, without preconceived direction. There are in the schools a few good books, in the midst of a multitude of bad ones, and such of these books and instruments as are esteemed and used in one province are unknown in another. The misfortune is, that no one knows for himself, and no competent person has taken it in hand to examine all these things and determine which to exclude and which to adopt for the use of the schools. If the Exposition should teach this alone, it would confer an immense advantage. A discernment, grave and assured of the best books, best instruments, best geographic charts, and best methods in use, even now, in all Italy, would contribute much to their diffusion and aid a revolution the most salutary that one could desire at this moment. Then would there work out for itself a career of progress, after the example of the most civilized nations, and perhaps

make apparent what distinguished and impartial men have already affirmed, viz., that in the matter of public instruction Italy posseses a richness of which she has not yet become sufficiently conscious."

The contributions of Italy to Classes 89 and 90 consisted of a great variety of books, charts, models, and other appliances in common use in the primary schools of that country—the number of collection entries being fifty-two—together with numerous reports, statistical, and other documents issued by the Society for Popular Instruction at Florence, and other institutions; and including, moreover, many remarkable specimens of the industry and artistic skill of the pupils in some of the technical schools, and, as a whole, constituted an exceedingly interesting study.

The educational statistics so well illustrate the intellectual condition of Italy that I cannot forbear a sufficient extension of this notice to include the most important. In 1864 (date of the latest statistics accessible) there were 31,675 schools for primary instruction, with 1,681,296 pupils instructed by 49,246 teachers; 1,427,063 of the pupils being children, and 254,233 adults. Distributed as to space, there was one school for each six kilometres[1] square, and for every 549 inhabitants; and one pupil for every 14 inhabitants. If we take the number of children of school age, (two to twelve years,) that is, of such as ought to be inscribed as belonging specially to the school population, there was one school for every 139 children, and one pupil for every 3.74 children.

In the total of pupils the boys and girls were in the proportion of 60 to 40. In the primary schools, the boys were to the girls as 100 to 85; in the secondary, as 100 to 6.

The public schools were to the private as 3 to 1. In the public schools, the average number was 42, (26 boys and 16 girls;) in the private schools, 22, (8.5 boys and 13.5 girls.) For the preparation of teachers there were 135 primary normal schools of different grades—64 for males and 71 for females—numbering 7,083 pupils; of which 2,718 were male and 4,365 female. The number of masters approved was 1,600; of mistresses, 2,017.

The average expense of each public school is 575 francs—three-fourths for personal service, and one-fourth for material. Of the total amount of money expended for primary education for that year, the government contributed 0.066; the provinces, 0.022; the communes, 0.761; the remaining 0.151 being derived from rents and different revenues.

The number of secondary and technical schools of the same date was 1,029, to wit: 466 gymnasia; 123 lyceums; 177 technical schools, and 363 ecclesiastical gymnasia and lyceums. Of all these classes of schools 219 are under the direction of the government; 276 belong to the provinces and communes; and 271 to private persons, exclusive of the 363 ecclesiastical establishments. The total number of pupils in the secondary schools was 53,432—26,142 in the gymnasia; 4,672 in the lyceums; 8,831 in the technical schools; and 13,787 in the ecclesiastical seminaries.

[1] One kilometre equals 1,083¼ yards.

The total cost of maintaining the governmental schools in 1864 was 4,234,287 francs, divided among the three classes as follows: To the gymnasia, 1,878,422 francs; to the lyceums, 1,196,086 francs; to the technical schools, 1,159,779 francs. The average expense was 20 francs for every 100 inhabitants. For every 1,000 francs of this revenue, 61 came from the rents of patrimonies; 469 from the government; 429 from the provinces and communes; the remaining 41 from different revenues.

The expense of educating one pupil in the lyceums and gymnasia was 180 francs, (about $36;) in the technical schools, 145 francs.

Of technical institutes there were, in 1865, 157, created mostly within the past few years; of universities, 20, fifteen under the direction of the government and five free, that is, independent.

The amount of the budget of the minister of public instruction, for 1866, was $2,865,786; of which $617,044 was for secondary education; $206,788 for primary, and the remaining $2,041,954 for the higher schools and universities.

TURKEY, EGYPT, MOROCCO, HAWAII.

Each of these countries contributed to the educational exhibits of the Exposition. Each has a department of public instruction provided for and managed, to a certain extent, by the state.

BRAZIL.

The imperial plan for the education of the people of Brazil is mainly very liberal; but owing to the vastness of the empire, its area being a little greater than that of the United States, and the sparseness of the population—the total being less than 12,000,000, and the average of the most populous province scarcely exceeding thirty inhabitants to the square mile—the difficulty of carrying the provisions of the law into force is very great.

The law requires the establishment and maintenance of two primary schools—one for boys and one for girls—in each parish, and, at least, one school of secondary rank (lyceum or college) in every principal town. It also provides for the establishment and support of various superior and special schools, of which there are many already in existence.

Public schools, for primary instruction, are of two grades; the branches taught in those of the lower order being simply rudimental, in those of the upper grade such as are taught in the intermediate and high schools of this country.

In the municipality of the imperial capital, primary and secondary schools are under the immediate control of the government and of the general assembly, and are inspected by the minister of public instruction, an inspector general, a council director, and district delegates. In order to obtain authority to teach, the candidate must show that he is of legal

age, (twenty-one years to teach, and twenty-five years to direct a college,) to prove his moral character, and his capacity. If the candidate be a married woman, she must also show her certificate of marriage; if a widow, a transcript from the mortuary register recording the death of her husband; if divorced, the decree by which divorce was pronounced. Persons who would teach in, or direct, private schools are likewise subjected to these same tests.

Religious instruction is given in all the schools, though not necessarily in accordance with the Catholic faith, unless a portion of the pupils are children of Catholic parents; in which case the director, though a Protestant, must provide a priest for the Catholic pupils.

Pupils of both sexes are not permitted in the same school, and in establishments designed for girls, no person of the other sex, over ten years of age, is allowed, except the husband of the principal.

Primary instruction is gratuitous, and, according to the law now in force, it is to be made obligatory as soon as the government shall deem it advisable to put this provision into execution.

The number of pupils in the public primary schools in 1867 was reported, by authority of the government, as exceeding 107,000; the proportion of girls to boys being as 28 to 79. These figures are said to convey a very imperfect idea of the number of children actually instructed in the several provinces of the empire, because of the large number of private schools not included in the statistical returns.

Secondary instruction, though not entirely gratuitous, is liberally sustained by the government. The number of pupils in the secondary schools, public and private, is estimated at 2,718 for the municipality of the capital, and 4,771 for the provinces, in which both primary and secondary schools are managed by the provincial presidents and legislative assemblies, in a manner modeled after the imperial administration.

Among the superior and special schools may be mentioned the following: two faculties of medicine, with annual government aid amounting to 211,770,000 reis, (about $105,885;) two faculties of law, receiving about $77,650; 11 theological schools, all subsidized by the state but one; several military schools, receiving annual aid to the amount of $151,445; one naval academy, receiving $57,714; one commercial institute, receiving $9,000; one institute, each, for the blind and for deaf-mutes, receiving $25,989; an academy of fine arts, receiving $18,650; and a polytechnic institute, together with several scientific and philosophical societies, a national museum, and a national library of nearly 100,000 volumes, all either wholly sustained or aided by the government.

The Emperor has the purpose to establish a great national university, comprehensive in its scope, and employing the best material and talent the government can command, and commissioners are already at work perfecting a plan.

THE ARGENTINE REPUBLIC.

Owing to internal dissensions which so long distracted the peace of this republic and retarded its development, whether material, social, or intellectual, education has here made but little progress. Since its organization, there have been a few institutions of higher grade in the principal towns, but scarcely any schools in the country districts of any of the provinces.

Popular education has yet to be instituted. Laudable efforts, to this end, have been made through a series of years by a few leading men, chief of whom has been the learned, liberal, and patriotic Sarmiento, late minister of the republic to the United States, and, I am happy to add, President elect of the republic in whose educational cause he has so long labored.

During former visits, as well as at the time of his recent residence in our country, this distinguished gentleman has been most indefatigable in collecting and digesting information upon the subject of popular education, with a view to making it practically useful to his own country. In this call of his appreciative countrymen to the high duty of directing the affairs of the nation, there seems to be good ground for the hope that with his administration will begin the noble work of establishing a broad and liberal system of education for its 1,355,000 people.

GREAT BRITAIN AND IRELAND.

In the revision of the educational code of Great Britain, adopted in 1867, will be found some noticeable improvements bearing upon the condition and prospects of its elementary schools.

An annual sum of money is granted for public instruction administered by the department of education, of which the lord president is head. The object is to promote the education of the children of manual laborers. The means used are to aid local effort to establish and maintain elementary and normal schools for the instruction of children and training of teachers for this department. All schools receiving aid from this grant must be in the interest of some recognized religious sect, or have daily readings from the authorized Scriptures. They must also be open to the inspection of persons appointed by her Majesty in council, the committee on education having consulted with the religious bodies interested before nominating inspectors, who may not in the least interfere with the religious instruction given, or with the management of the schools, their duty being simply to ascertain whether the conditions of the aid given are fulfilled, and to report to the department.

Aid to establish schools in building, improving, and fitting up schoolrooms and dwellings for teachers, is limited to the amount contributed by proprietors, residents, or employers of labor in the parish, or within four miles radius of the school. No aid is given to establish normal

schools, buildings and fittings being obtained by voluntary contributions from those interested.

Aid is given to maintain both elementary and normal schools, upon the conditions hereinbefore named, to which are added the attendance and proficiency of pupils, and the qualifications and faithfulness of teachers.

Endowed schools, to receive aid, must meet the conditions required of those of lower grade, the annual grant to a school of this class being reduced by the amount of endowment income, the reduction being omitted when both grant and income do not exceed 15*s.* per scholar by average for the year.

Normal colleges, to which the normal schools are inferior departments, have aid to the amount of £20 per annum for each master, and £14 for each mistress—until the sums have reached, respectively, £100 and £76—who, having been trained there for two years, have completed the prescribed probation and obtained certificates for teaching in the same school until, with an intervening year, they have had two favorable reports from inspectors of the same, or been reported by the proper authorities as having completed a like period of service as elementary teacher in the army or royal navy, the poor, law, industrial or reformatory schools.

Masters and mistresses who have been trained for but one year may obtain certificates upon the same ground as those for two, in which case five annual grants of one-half the above-named sums are made to the institutions where they have been instructed.

The early history of education in Scotland compares more than favorably with that of England. Almost four hundred years ago it was enacted that children of the barons and freeholders should be sent to the parochial schools from the ages of six to nine years, and after that to seminaries of higher grade. Neglect of this duty met with a penalty very severe for the fortunes of the times. Later, and almost two hundred years since, legal steps were taken for the establishment of a school in every parish, with provision to assess the lands for that purpose.

Compulsory attendance has been the policy of the Scottish government; and the support and position accorded to instructors of youth from that early time, with the advance since made, not only in salary for service, but in the quality of that rendered, show that it has been the intention to magnify the office of the teacher, and to make the school-room tell upon the national prosperity both at home and abroad.

But as the old plan of leaving the education of the people pretty much alone has been found, in England, incompatible with the growth of liberal sentiment in the world and the growing importance of *the people*, so the old systems of schools in Scotland have proved unequal to the advancing needs of the times, and both countries are now experimenting as to the ways and means of a more efficient national scheme of public instruction.

The provisions of the revised code apply to Scotland, and in the statistics given it is included with England.

From reports of 1866, the number of schools inspected was 13,586, with an average attendance of 1,082,055; and the parliamentary grant for public elementary instruction, including normal schools, was £693,078. In addition to this, the cost of inspection, with that of the office of administration, amounted to £75,030.

The entire expense of these schools, including, besides government aid, income from endowments, school pence, voluntary contributions, and other sources, amounted to £1,333,887. The number of normal or training colleges for the same year was 48, and the public aid received by them, £74,873; the actual cost of their support being £102,693.

The total of public grants for elementary instruction from 1839, when the present educational code was adopted, to 1866, was £8,883,272, of which normal schools have received £1,206,229.

It being the policy of the government to help only those who are able to help themselves, it appears that, nothwithstanding these figures of actual outlay, there were yet, in 1866, 11,635 parishes, representing a population of over 4,000,000, in which, out of 2,099, only 2 in each 11 received any public assistance for schools; while of the poorer parishes, with less than 1,000, and the still larger number with less than 500 inhabitants, 10,404 were not reached to the least amount of aid; and that in the city of London alone, there were 156,000 children without instruction.

Deplorable as are these facts, they will still be found to compare hopefully with the statements made in 1850, by Sir James Kay, (now Shuttleworth,) and upon authority of her Majesty's inspectors into the condition of primary instruction in England and Wales, that there were then nearly 8,000,000 adult persons in those countries who could not read and write; and that of children, between the ages of five and fourteen, less than one-half were receiving any school training.

But while the great cause of education for the laboring masses has reason to arraign the policy of this wealthy and powerful land, England has done better by that secondary and superior culture whose fruits have fallen to the more favored of the middle and the higher classes. But even here, the plan of aiding most liberally the superior institutions, which must always be for the smaller number, is very noticeable; a most reprehensible neglect of ascertaining the condition and results of all intermediate schools having been, until quite recently, the habit of years past.

Investigations into this class of institutions, embracing the entire range of endowed grammar schools, proprietary and private schools, reveal beyond the fears of the least confident, that they are severally and together inadequate to the wants they propose to meet.

The commission of 1864, authorizing an inquiry into the state of secondary education for the United Kingdom, was limited by that of 1858 for primary, and that of 1861 for the nine great public schools of Eton,

Winchester, Westminster, Charter-House, St. Paul's, Merchant Tailors', Harrow, Rugby, and Shrewsbury. These schools were educating about 3,000. Besides these nine there were, in 1864, in England and Wales, 782 endowed grammar schools, with an income of £209,448, and attended by 36,874 boys. The proprietary schools of this grade had an average of 12,000 on their lists of pupils, making a total of 52,000 boys receiving what passes for secondary education, but which the commission pronounces in many cases not to exceed in value that of primary schools. Still, allowing it to be of its assumed character, out of 255,000 youths of the age and condition to demand secondary instruction, less than one-fifth can get it in any but strictly private establishments.

The distribution of these endowed schools is also a hinderance to such general usefulness as they might else have; located as they were at the time of their foundations, and now existing without regard to the more pressing needs of populous over those of less densely peopled districts. Another cause of complaint was found in the ambition of many masters to send numbers to the universities, and the very general practice of sacrificing those for whom no such promotion was contemplated, and who, at best, could have but a limited time in these schools, to such as were intended for superior culture. The extent of this school loss to so large a number as are involved, may be judged from the fact that, out of 700 grammar schools aiming to prepare pupils for the universities, but 153 actually accomplish this fitness, and these only in an average of from 19 to 1½ in each period of three years.

The great cause of this yearly increasing inefficiency of the endowed schools seems to have been an almost total lack of public interest in looking after them, and of any state oversight in managing the funds left in trust for their support, before the spirit and claims of the present time could have been foreseen. The facts of this negligence find illustration in the statements of the commission, that cases were found in which the overcrowded school was so far below grade that but one boy out of sixty could write correctly, from dictation, a sentence composed of words of but one syllable. In other schools there were masters with but six, four, and two pupils; and, in one case, but one. In still another instance, a master had held the position and for over thirty years drawn the salary for service, and had not one pupil during the time.

As a class, the statement is made that more than one-fourth of these schools were practically inoperative, because the masters, appointed for life, were blind, or deaf, or past work. The proprietary and private schools, ranking as secondary, are decided by the commission to be both better and worse than the grammar schools.

The character of the management of the Scottish schools of this class has produced results of great superiority over those of England; and it having been made the duty of the commission of inquiry into their condition to suggest means of improvement, recommendations based upon the better features of the Scottish administration have been made.

The principal of these refer to consolidating endowments too small to be of much practical value, grading them, and providing for the payment of masters in accordance with the amount and quality of service rendered.

Thus it will be seen that the entire subject of popular education is undergoing the regeneration of an aroused public interest and state care, such as it has not before received, and from which may reasonably be expected results worthy of the times and the cause.

In superior education, the universities of Great Britain speak for themselves; those of Oxford and Cambridge being a glory to the nation that has fostered them. These two universities are permanently endowed, and are also aided, as needs arise, by private and public means. With a board of instruction of professors ordinary, extraordinary, and tutors, numbering about 250, they are educating an average of about 1,000 students. The four universities of Scotland (Edinburgh, Glasgow, Aberdeen, and St. Andrews) are likewise of early date, and on foundation endowments mainly equal to their needs; and, with an instructional force of less than 100, are giving training in the department of superior culture to 3,500 young men.

In schools for special education there is an awakened interest, the universities to some extent having added courses upon applied science, and institutions for professional scientific culture springing up independently, or claiming co-ordinate rank with those already existing. References to the principal of these will be found under their appropriate groupings, in the several divisions of this report.

The system of public elementary education in Ireland, as in England, depends, to some extent, upon parliamentary grants administered by a board composed of both Catholic and Protestant members. The chief point of difference in the systems adopted for the two countries, is that of England undertaking to combine secular with religious instruction in some denominational interest, while that of Ireland is to separate these as far as possible in the schools. The minority of Protestant influence there is gradually yielding this point to the Catholic majority, and the latest revision of the school code of Ireland, in 1866, gave prominence to this feature. The effect sought—that of a more hearty co-operation of the whole people who patronize the public schools—is believed to be thus advanced.

The number of schools reported in 1866 was 6,453, with an average attendance of 321,901. The annual public grant to these primary schools is about £350,000. There is in Dublin a normal school, besides 25 district and inferior schools of this class, all of which have an attendance of 12,000 pupils. The board of elementary school instruction assists, also, 145 workhouse schools, giving instruction to 20,000 children; 19 schools in connection with prisons; 138 convent schools; 104 agricultural school farms, and four school gardens.

In superior and special education, Ireland has the University of Dublin, with an income of £50,000; and colleges at Belfast, Cork, and Galway, all of which, besides endowment incomes, are quite liberally aided by public funds.

There are various literary and scientific schools and societies, institutes and academies of arts. The Museum of Irish Industry, established at Dublin, attracts to its scientific school large numbers of students, at which point charitable and professional institutions of higher grade are mainly located.

A more careful survey of the statistics of this portion of the United Kingdom will result in the conviction that it is neither educationally nor morally so far behind the general status of the whole as is very generally supposed.

THE CANADIAN PROVINCES.

The system of public instruction in these provinces is, in each, somewhat different, and altogether so composite, and in process of such changes, that any detailed account of them is deemed inexpedient for the purpose of comparison. That there is a very general interest in the subject and an earnest movement in the direction of finding the most approved methods of other countries, is manifest from the assimilation of some of the best points of the American and European systems.

The marked feature of the school policy of both provinces is that of encouraging rather than requiring the maintenance of any plan of public primary instruction.

The administration of the school code is in the hands of a council in connection with a chief superintendent, elected for life, with local superintendents, county, township, and section trustees. The face of this is promising enough, but the working out of it is bad enough, for reasons that will presently appear.

Under the voluntary system, while it is left to the council to regulate all matters connected with the maintenance of a normal school, with its dependencies of model schools, and for the organization and classification of common schools; to recommend text-books, and make regulations for the support of worn-out teachers; and to the superintendent to see to the outlay of all public moneys disbursed for the schools, and to the administration of the same; it is yet left to the section trustees to determine, not only the number and character of the schools, but, indeed, whether in that section there are any public schools at all. These trustees, three in number, elected by a majority of the freeholders present at the meeting for this purpose, hold office during three years, and for that period the fate of public instruction is in their hands, the law requiring nothing, but simply empowering, at their discretion, action within given limits. They

have in custody all school property of the section, and do as they judge best in regard to building, repairing, renting, warming, and furnishing school buildings; in employing and dismissing teachers, &c.; and upon default of the annual meeting of freeholders to decide, or their decision as to ways and means proving inadequate, may themselves determine in which of the ways approved by law the schools of that section are to be maintained. These provisions are by voluntary contributions; by rate-bills not exceeding, for the country districts, twenty-five cents per month for each child in attendance; or by a rate, equal to meeting the demand, upon the entire taxable property of the section.

As a rule, the smaller the number of persons actively employed in discharging a given duty—provided they are competent and interested—the better the duty is performed; but I doubt if the educated intelligence of any country in the world is equal to meeting such responsibilities as this plan leaves to men likely to be thus selected.

There is in Upper Canada an income arising from the sale of lands for that purpose, known as the grammar-school fund. This money is distributed at the rate of $400 to each senior (county seat) grammar school which has an average of over ten scholars, and of $200 if below ten. The amount of these payments having been deducted from the income of the fund for the year, the remainder is, through the superintendent, distributed to all the other grammar-schools of the province, according to conditions made by the council of public instruction. Should the sums thus derived be found unequal to the support of a given school, a municipal tax and a small rate-bill levied upon the pupils are resorted to.

A fund of $20,000 for superior education is annually provided by parliament and distributed among the collegiate institutions.

Specially considered, the educational fund of Lower Canada is divided into that for inferior and superior education; that for the first is dependent upon the annual rate of the legislature, the latter is derived from suppressed estates of Jesuits, other supplementary sources, and the annual grant of $20,000.

The application of this money embraces in its scope not only the higher institutions of learning, but academies, normal and model schools, and whatever comes above the grade of elementary instruction. It is also provided by law that, if the income of this fund falls in any year below $88,000, the deficiency may be made good by a draft upon the common-school fund.

Under the operation of the systems in the provinces of Upper and Lower Canada, there were reported, in 1863 and 1864, 7,737 elementary schools with a gross enrollment of 557,547 pupils; for Upper Canada, about one in four for the whole population, though the average for the year shows but thirty-eight per cent. of the enrollment. The total expenditures of these schools for the year was $1,874,712, out of which sum $274,927 came of public appropriation.

During the same year there were 5,352 pupils reported as in attendance upon grammar schools, at an expense of $85,910, $44,274 of which was from legislative aid, and which averages about $900 to a school, and $16 per scholar for the year.

In both provinces are institutions aiming at higher instruction than can be furnished at the schools mentioned. Principal among these is that originally known as the Royal Grammar School, but more recently as the College of Upper Canada. This institution is at Toronto. In Lower Canada are found a number of schools classed as academies and colleges, and both classical and industrial in character.

UNITED STATES OF AMERICA.

From the earliest settlement of this country by those brave men and women who landed on the rocks of Massachusetts Bay, no less imbued with the spirit of freedom and popular education than the love of God and liberty of conscience, the cause of education has been one of primary interest to both colonial and federal governments. A history of the sacrifices and toils by which were established and maintained the school-houses of the ante-revolutionary times of the colonial period, and a summing up of the truly munificent contributions of the federal and State authorities since the adoption of the constitutional government, to the great end of creating a citizenship worthy of our free institutions, are sufficient to awaken the ambition and enthusiasm of the dullest soul.

And yet, properly speaking, there is no American system of public instruction. Left, as it is, to the States, each in its sovereign capacity, to devise and execute such provisions for the education of the people as may be deemed expedient, the diversity of plans is great. The details of these numerous plans are not regarded as appropriate to this report. Only the features characterizing the school systems of the States, as a whole, and an approximate statement of the funds set apart and appropriated for school purposes, can here be given. More than this is not really needed for the purpose of making a general comparison of our educational condition with that of other nations.

Again, even if it were desirable, and if time and space were equal to the work, it would be impossible to furnish as late and as accurate statistics as are found in most European countries, since in this, as in other information and statistics relating to our material and social prosperity, there are no such provisions made for ascertaining, from year to year, our actual status as are made in the countries of the Old World.

The public school systems of the several States have the following fundamental provisions: The acceptance of such grants of land as have been made by the general government for school purposes, and the investment of funds arising from sales of the same, together with those accruing from State and individual endowments, to the establishment of

schools for public instruction. The supervision of these schools by a superintendent, whose office has the dignity of a department of the State, and whose official authority is final in all matters pertaining to the apportionment and disbursement of public moneys for, and in whatever relates to the harmony and general interest of the local administration of the schools, under the constitutional provisions of the State. The supplementing of such income as may arise from endowments on deposit by a local tax, and by the annual appropriations from the State treasury of such sums as may be demanded by the school interest of any given year.

These provisions are substantially the same in all the northern and in some of the southern States; while in districting the State for school establishments, selecting sites, and erecting school buildings, certificating and employing teachers, supervising the local administration, &c., there is a great diversity of plan, and every result but the best, arising chiefly from the independence of small districts and intrusting neighborhood interests to incompetent or inadequately compensated persons.

The actual amount, in value, of the endowment fund of the entire Union cannot now be estimated, since it is yearly increasing from the sale of lands and better investment of proceeds. It was aggregated some ten years since, and it then reached the value of not less than $50,000,000, and it must eventually far exceed that sum. In some of the individual States it has already amounted to millions, varying from two to ten, the annual expenditures of whose schools from endowments, taxes, and appropriations are also counted by millions; that of New York, in 1866, being over $7,000,000.

All in all, the original provisions of the government for the education of the people are more liberal than those of any other; and in connection with the additions arising from regular taxation, and from appropriations made by the States themselves, present the most magnificent financial school basis of the world. The pride with which the American citizen regards this support of common school instruction is amplified by contemplating the scarcely less abundant endowment by which individual wealth has built up the higher grades noticed under the head of secondary education.

And yet, in that which relates to the elementary education of the whole people, our people are very far from being instructed. The school returns of 1860 and 1861, the latest that are, as a whole, available, with an expenditure of nearly $25,000,000 for primary schools, show that scarcely more than one-half of the children of school age were in the schools. It must be taken into account, however, that the school ages of our States embrace a longer period than those of European countries, averaging from five to twenty years. Nor should it be forgotten that the estimates of the past, and including the dates named, were made upon the basis of a free white population. Since that date, the colored children of the South have been placed at school by hundreds of thou-

sands, and great advance has been made in improving and diffusing elementary education for all classes of that portion of the Union.

As apportioned for the years of 1860 and 1861, the 5,000,000, and somewhat more, of children in attendance upon the public common schools was one in five and a half for the entire white population; the distributions of which, in the great sections north and south, were one in four for the first, and one in fourteen for the last named, the division of the expense of the whole being proportionally greater.

Without making further comparisons between the States whose school provisions and school results widely differ, either as independent States or as sections of the country, it ought not to be omitted that there is room and urgent call for great improvement in whatever has to do with our common school interests. It is a fact worthy the consideration of all, and the consideration of which becomes the sacred duty of our legislators, that while many foreign governments are reducing crime and ignorance by a much smaller relative outlay of money, we are annually adding to our school funds without a corresponding diminution of either. It is is the language of the national Commissioner of Education, that " with all our State, municipal, and voluntary efforts for education, there is an immense amount of absolute illiteracy, and of corrupting influences arising therefrom; and that a diminution of this illiteracy, vice, and crime has not kept pace with our increased means of education." This is the language of the statistics of State and municipality on the needed increase of accommodations for juvenile offenders and of the appropriations made for their restraint and improvement; and, more potent than all, it is coming to be the language of the street-corners and alleys, not of our great cities alone, but of our towns and villages, wherever the guardians of the school population have not the natural appreciation of the value of school instruction, nor the public justice to require a regular school attendance.

If a multiplication of words could be of any advantage, there is room for any length of discussion and suggestion in regard to the improvement of this great interest. But the aggregated wisdom of such as have investigated, observed, argued, and presented every phase of this subject during the last fifty years, would furnish a respectable library of educational statistics and comparative values of educational schemes.

EDUCATION OF THE FREEDMEN.

Although somewhat beyond the scope allowed to this report, I cannot close this sketch of general education in the United States without reference to the efforts now so widely made for the education of the freedmen. This great and rapidly expanding work has been organized and finds expression through the Freedmen's Bureau, established in Washington in March, 1865, and placed under the direction of General Oliver O. Howard. A series of eight semi-annual reports on "The Schools for Freedmen" has been published, dating from January 1, 1866, to July 1,

1869, in which a detailed history of the school work in each State will be found. A very interesting review of the operations of the bureau has already been published[1] by Mr. Sidney Andrews, and I avail myself of two instructive tables which he has compiled from the above-mentioned reports, and which show most eloquently the progress and importance of the work.

Table showing the number of freedmen's schools, teachers, and pupils.

Date.	Day and night schools.			Sunday schools.		
	Schools.	Teachers.	Pupils.	Schools.	Teachers.	Pupils.
January 1, 1866	740	1,314	90,589	....	....	....
July 1, 1866	975	1,405	90,778	....	....	....
January 1, 1867	1,399	1,658	99,513	782	850	70,610
July 1, 1867	1,839	2,087	111,442	1,126	1,808	80,647
January 1, 1868	1,914	2,202	102,070	1,170	4,290	87,447
July 1, 1868	2,681	2,787	123,644	1,345	5,857	118,170
January 1, 1869	1,979	2,266	106,977	1,306	5,573	84,965
July 1, 1869	2,912	3,357	149,244	1,512	6,146	107,109

Of the pupils at the date of the last report all but 6,746 were slaves at the opening of the rebellion. In 1867 the freedmen paid $150,000 for tuition and $60,000 for school buildings; in 1868 they paid $175,000 for tuition; and in 1869 the account will reach about $200,000 for tuition and $125,000 for buildings.

NORMAL SCHOOLS FOR FREEDMEN.

The sixth semi-annual report upon schools for freedmen contains short notices of some of the principal normal schools. It is stated that but few of these institutions as yet approach the true idea of such an institution, but they are well designed and the plans for most of them are excellent and thorough. They will, as soon as possible, supply teachers for the freedmen from their own race. Among those cited are: The Howard University at Washington; the Fisk School, Nashville, Tennessee; Berea College; Biddle Memorial Institute; High School, Quindaro, Kansas; Lincoln University, Oxford, Pennsylvania; Avery College, Alleghany City, Pennsylvania; and the Hampton Normal and Agricultural Institute, Virginia.

The Howard University, Washington, D. C., was incorporated by Congress March 2, 1867, and is designed to afford special opportunities for a higher education to the freedmen. The trustees purchased one hundred and fifty acres of land in a very favorable location near the city, and by selling about two-thirds of it for building lots, secured, with a little additional help, the means of payment for the

[1] In "Old and New," while this report was passing through the press, February, 1870.

whole. By the aid of the educational funds of the Freedmen's Bureau two large buildings have been erected, one for recitation rooms, philosophical chamber, laboratory, library, offices, and chapel, and the other for dormitories and a boarding-hall. It is the design of the trustees to build up at the nation's capital a large and efficient institution, amply sufficient for supplying the demand of this new era and to give intelligent youth, whatever may have been their previous condition, the benefits of a thorough collegiate and professional education.

The Hampton Normal and Agricultural Institute was opened under the auspices of the American Missionary Association in April, 1868. It was incorporated in the following September, "for the purpose of preparing the youths of the South, without distinction of color, for the work of organizing and instructing schools." The location is a very suitable one, and the institute appears to be peculiarly well adapted for the work, and is conducted on wise principles. It was commenced and is energetically managed by General Samuel C. Armstrong.

POPULAR EDUCATION.

CHAPTER III.

PRIMARY EDUCATION.

General agencies of primary education—School buildings at the Exposition—General disregard of proper ventilation—The school-house from the United States—School buildings of Switzerland—Necessity for improvement in our school architecture—Prussia, outline of branches taught in a primary school—Comparison with the primary school instruction in the United States—Supplementary agencies of primary education—Lectures, lyceums, libraries—Schools for the destitute and vicious—Schools for the idiotic.

There is a sense in which the term "popular" embraces the entire range of the education of a people; but the intention is to restrict it here to the more usually accepted idea of "common-school education."

I.—GENERAL AGENCIES.

In no one respect is there, for the nations attempting a systematic diffusion of its blessings, so radical a defect as in the character of the buildings provided for primary schools. Details on this subject are not within the range of this writing; but the vast educational interests involved forbid the omission of such references as may direct the attention of both patrons and government to the existing defects and their remedies.

SCHOOL BUILDINGS.

After an examination of the school buildings on exhibition at the Exposition, the observations in many lands, and the collation of numerous reports on school interests, it is respectfully submitted that the buildings of this class do most lamentably fail of their proposed end.

Just here both pleasure and duty call for a reference to the exhibits of school buildings at the Exposition, (a special report on which, and on kindred subjects, was assigned to another Commissioner,) for the purpose of noticing the enterprise and success with which the State of Illinois furnished a school-house which, in all respects of adaptation to school purposes, was not only superior to other exhibits of its kind, particularly in respect of neatness and means of lighting and ventilating, but to the average of those I have found in any European country. It is also to be noted that the commissioners, through whose agency it was provided, did not aim to present a school-house peculiar to their State, nor yet the

ideal one of an American educator, but a real one, such as might serve to show the average (this one a little superior) of those in actual use as the "cross-roads" and "country school-house" of the northern and western States.

But even this school-house was seriously faulty, in that it did not properly provide for ventilation, though in this respect superior to those from Prussia, Saxony, and Sweden, providing not at all—its three large windows opening both from the top and the bottom; while in the others the windows, besides being inadequate to lighting, had upper sashes that were immovable. Still, every one who understands the physiology, so to speak, of ventilation, as well as its chemistry and mechanics, knows that in winter this mode of purifying the vitiated air of an apartment, while it effects the intended object, can do so only at the peril of some of the occupants.

It would add but a trifle to the cost of a school building to ventilate by flues, so constructed as to be managed at pleasure, and to give to each pupil, without the calamity of cold-taking inseparable from window ventilation, a constant supply of fresh, pure air, which would be of incalculable economic value to the soul and body of a school population.

While it would have been unfair to place on exhibition a building quite superior to its kind, when assuming to give an opportunity of comparing the actual status of the American school-house with those of other nations, it is none the less deplorable, and none the less disgraceful to our own than to other countries, that the importance of thorough ventilation should have so little practical recognition. We know that each child needs at least eighty cubic feet of air for the processes of a healthy respiration. Where, among the volumes of school enactments and regulations, are to be found the requirements of law to this end? While many are ample in providing the requisite number of schools, and not a few are taking measures to see that the teacher is not overtasked in the number of pupils in his individual care, the child for whom these provisions are primarily made is confined to such space as his elbows may secure, and his lungs limited to a scanty and vitiated share of the air provided for a defrauded set of school-fellows. As far as school statutes show the action of government in this regard, England alone, while so far behind in most of its common-school provisions, enacts that the aid granted to a school is to be withheld, "if the school is not taught in a building certified by the inspector to be healthy, properly lighted, drained, and ventilated, and containing, in the principal schoolroom, at least eighty cubic feet of internal space for each child in average attendance."

These vital physical conditions having been met, there remain the desiderata of agreeability and pleasurable emotions to be considered; and no school-house is thoroughly adapted to its purposes whose appearance does not inspire emotions of real pleasure in its attendants.

LOCATION OF SCHOOL BUILDINGS.

The only commendatory words, from a host of school reports, in regard to both the structure and location of primary schools, and which are confirmed by personal observation, are in the honor of Switzerland, by the French school commissioner, M. Baudouin, who says: "The smallest village has its school-house, the greater number of which are pretty, spacious, well lighted, and pleasantly situated."

From an American report I extract the following criticism, which, while it is too severe for most, is yet so literal a representation of the facts of a large portion of the rural districts, where such a state of things is least excusable, that it ought not to be omitted: "Thousands of children are sent daily out of heated and otherwise wretchedly uncomfortable school-rooms into play-grounds where there is nothing but a parched earth and a blistering sky. From that one whose treeless, shrubless yard contains only the building upon which have poured the red heats of the ascending day or clouds of roadside dust there will hurry an impatient crowd, every individual movement of which says, plainly enough, 'Anywhere but here!' These are the half-baked, irritated little irresponsibles who go forth to vent the bad blood of our bad philosophy of education upon whatever comes in their way. On the other hand, those who go out from the embowering shade of trees into grounds beautiful with vine and shrub and flower, pass as naturally into the enjoyment of rational pastimes as the birds to their carols amid the summer boughs."

The United States are annually expending immense sums of money—amounts that can only be enumerated by millions—in the enlargement of old and the construction of new school buildings, not one in one thousand of which, in either structure or surroundings, has regard to the principles involved in the material conditions necessary to the physical, moral, and intellectual health of the children. There is no reason that we should not, but every reason that we should, begin the inauguration of a school architecture worthy of our prosperity as a people, and worthy of the estimation in which our institutions hold the children who are to become the sovereigns of this great commonwealth.

PRUSSIA.

In the general survey of education in Chapter II a general exhibit of the courses of study in various countries, shown by their schemes of primary education, has been made; but, for special reasons, some differences in these courses and in the methods of imparting instruction will now be noticed. Since the field is so large, these notices will be chiefly confined to Prussia, where, for the expenditure of time and means, is secured the most, and to the United States, where is secured the least, of that which is the aim of all—educational result.

The following outline of branches taught in the eight years' course of a primary school is divided into four parts of two years each:

Part first, including children from six to eight years of age, embraces four principal branches—

1. Logical exercises, or oral exercises of the powers of observation and expression, with religious instruction and the singing of hymns. 2. Elements of reading. 3. Elements of writing. 4. Elements of numbers.

Part second, with children from eight to ten years of age, seven principal branches—

1. Exercises in reading. 2. Exercises in writing. 3. Religious and moral instruction, in select Bible narratives. 4. Language, or grammar. 5. Numbers, or arithmetic. 6. Ideas of space and form, or geometry. 7. Singing by note, or elements of music.

Part third, with children from ten to twelve years of age, eight principal branches—

1. Exercises in reading and elocution. 2. Exercises in ornamental writing, preparatory to drawing. 3. Religious instruction in connected Bible history. 4. Language, or grammar, with parsing. 5. Real instruction, or knowledge of nature, including elements of the sciences and arts of life, of geography, and history. 6. Arithmetic, through fractions and rules of proportion. 7. Geometry—doctrine of magnitudes and measures. 8. Singing, and science of vocal and instrumental music.

Part fourth, with children from twelve to fourteen years of age, six principal branches—

1. Instruction in the religious observation of nature; life of Christ; history of the Christian religion, in connection with contemporary civil history; doctrines of Christianity. 2. Knowledge of the world and of mankind, including civil society, elements of law, agriculture, mechanic arts, manufactures, &c. 3. Language, and exercises in composition. 4. Application of arithmetic and mathematics to the business of life, including surveying and civil engineering. 5. Elements of drawing. 6. Exercises in singing, and the science of music.

The independence of the several States of the Union, as of each municipality in the separate States, renders it impossible to furnish, since it does not exist, a uniform grade of studies pursued in any class of schools; but the following outline of the range and extent of instruction furnished in one of our eastern cities will give a fair showing of the primary course found in many of our cities and larger towns. School age also being optional, an average is taken as approximating to the facts of the case.

First year, with children from six to seven years of age: Reading and spelling; reading numbers to 100; adding and subtracting with small numbers, by use of objects and the numeral frame; drawing small letters, capitals, and the Arabic numerals on slate; daily exercises in enunciation; oral lessons on form, size, color, illustrated by objects in the room, and the same on familiar plants and animals; repeating verses and maxims; singing and physical exercises.

Second year, with children from seven to eight years of age: Reading and spelling; punctuation marks from cards; notation to 1,000; multi-

plication and division as far as 144; oral instruction in the most common phenomena of nature, and the elements of geography; maxims and verses; singing and physical exercises.

Third year, with children from eight to nine years of age: Reading and spelling, with instruction on punctuation and the use of capitals; rules and small examples in arithmetic, through the simple rules and their combinations; geography, through the United States; Roman notation completed, with exercises, in both print and script, on slate; oral lessons from nature, also on objects and occupations, with comparison and classification; verses and maxims; singing and physical exercises.

Fourth year, with children from nine to ten years of age: Reading and spelling; primary geography and arithmetic finished; grammar and United States history commenced; writing.

Fifth year, with children from ten to eleven years of age: Reading and spelling; intermediate geography; arithmetic, through reduction, with applications of past rules to practical questions; grammar and history advanced; writing and composition.

Sixth year, with children from eleven to twelve years of age: Reading and spelling; intermediate geography and United States history completed; arithmetic through fractions and compound numbers, with miscellaneous practical examples; general history commenced; grammar, to syntax, with writing and composition.

Seventh year, with children from twelve to thirteen years of age: Reading and spelling; geography reviewed; arithmetic through percentage, ratio, proportion, and alligation, with general review; history advanced; grammar finished; writing, book-keeping, composition.

An estimate of the comparative value of these courses of study must have regard to both methods and universality, no less than to the branches themselves. In the branches taught, the course prescribed for the Prussian school is quite in advance of ours, particularly as regards drawing, music, adaptation of instruction given to a knowledge of nature and the arts of life, and religion.

To the early practice of drawing familiar objects is to be attributed the very noticeable excellence of the penmanship of their youths, and of the adult peasantry of the country. To the continual advance of this art may be traced the development of the great mechanical and manufacturing genius of the people, and with no special reference thereto or loss of school time, as it is the experience of their teachers that drawing, as practiced from first to last in their primary schools, may be made incidental to the furtherance of almost all other studies.

The direct effort made to render the instruction given subservient to the common end, knowledge of nature and the arts of life, is two-fold in its object—the first being in the interest of scientific and mechanical uses for the business of life, and the second, a never-lost-sight-of aim,

to inculcate ideas of the beauty and utility of nature with the principles of morality and religion.

The music with which the Prussian course of study is so interspersed needs no commendatory word, any more than does that practice of physical exercises for which provisions are so generally made. So long as the body and the mind have co-ordinate powers in the development of the individual, it is wisdom to recognize and folly to ignore the means by which the best conditions of each may be reached. In these foreign schools both music and gymnastics rise to the dignity of branches taught during the years of primary instruction, since one is specifically named for the school-room, and, by a practice that has come to have the authority of a precedent, the teacher so takes part in the pastimes of the pupils that he is enabled to attract them to the best methods of exercise.

The extent to which the instruction, as indicated, is given is measured by the extent to which the school law of the kingdom furnishes instruction at all, since it is not left to parish, hamlet, or city to decide what shall be the course of study for its primary schools—the law prescribing and enforcing the same for all. Thus, whatever advantages may be derived from a rudimental education in those branches of human knowledge which generations of the world's ablest educators have deemed essential to any of the various classes of society are here provided for the most obscure of its peasantry.

PRIMARY SCHOOL INSTRUCTION IN THE UNITED STATES.

The methods by which courses of instruction are severally made available to pupils are very different; but to give an adequate idea of the methods through which not only Prussia but other of the continental countries have managed to incorporate the information and the discipline of study into the great body of school children would be impossible in an account not illustrated by numerous examples. These methods are the result of a careful investigation of the philosophy of the human mind, in connection with such material aids as will most naturally facilitate a prompt and healthy response to efforts for its development. According to the decisions of that investigation, methods of imparting instruction have been defined, appliances furnished, teachers qualified, and attendance demanded with a unity and inflexibility of purpose for which the history of education finds no parallel.

In our country no courses have been prescribed, no methods defined, no appliances furnished, no teachers qualified, and no attendance demanded, as referring to any unity of action or standard in any of these particulars. As a consequence, while the theory and practice of one system work to the same end the theory and practice of the other are at variance.

Perhaps the distance between the methods of instruction found in the two countries may be made to appear more clearly in the light of the two simple propositions that are fundamental to all theories of educa-

tion—that acquisition should not go beyond discipline; that study should not be allowed to weary. These propositions are not only respected in the Prussian school scheme, and instructors prepared with direct reference to them, but the utmost care of the government is directed to the end of both, that the results may be true to the propositions. The philosophy of the American idea is equally high and truly based, but we have no machinery for bringing about the results.

A Prussian child is not permitted to use the language of an idea he does not make his own. Spelling long columns of words, and reading pages of words such as could not be intelligently made available in conversations with teacher and school-fellow, are not allowed; and the same principle is carried through the instructions of the first to the last day of its eight years' drill. And yet, by that intimate and constant habit of conversation between pupil and teacher upon the many topics of school study, and the endless correlations of kindred and suggested subjects which it is a part of the teacher's preparation for his work to know how to bring in, the children of these schools, at a very early age, come to have a use of language far beyond the range of their studies. I say *use* rather than knowledge of language, for the purpose of calling attention to the difference in the educational value of these words. Nothing is more common than for one of our school children to call out so much of a sentence as barely gives the answer to a question. A Prussian teacher does not accept, to such as ask the color of the child's dog or the father's house, "black," "wood," but requires of the youngest pupil an expression of the sentence in which these words would occur as correctly as if made by the teacher himself, helping the new beginner in the art of conversation by requiring those more advanced to give the same answer in various correct forms of speech.

The packing process of our aim, to get the largest possible amount of information in the smallest possible time, defeats itself, in that it gives so little opportunity to assimilate and apply, without which the mass of mere information slips from the memory or remains a clog to the natural action of any special faculty.

The more universal use of instructional appliances in these schools is greatly in contrast with our use of text-books. Contrast the hours of study which our children devote to pages on pages of unillustrated theories—to days and weeks of recitations unillumined by conversations—to treasures of acquisition unapplied to life, with those theories that are illustrated by every device of mechanical genius—those recitations that are made brilliant by the reproduction of times and actors—those acquisitions that are applied to every interest and use of life, and you have before you a sample of the district school of America and the parish school of Prussia. The lessons are short and so varied with oral instructions and illustrative mechanism that weariness is seldom induced; so that the recreations of play-ground and work-shop, of gar-

dens and music, are not so much a refuge from the tasks of the school-room as a part of the instructioaal scheme.

It is with great reluctance that the superiority of provisions for securing so high a grade of primary education has been accorded to a foreign rather than a home administration, nor am I willing to admit that courses as complete and methods equally good are not found in some of our city primary schools; still, so far as positive knowledge goes, it cannot be affirmed, while the average of both will compare unfavorably with those of many other countries. The course of study, alone, for the time required, is in favor of the foreign methods of teaching. Making the facts of attendance equal for both, with our methods of teaching, I do not believe it could be accomplished in the given time. This is said after a consideration of the difference in the homes from which the children of the two countries come, and the conceded unusual sprightliness and versatility of the "young American" intellect. But we give no such attention to the physical training of our youth as is there given. With anything like such care as many European nations bestow upon this there is no doubt that the physique of our children would respond to an ideal of great superiority.

If it is with reluctance that a comparison is here made between the courses of study and the methods of teaching distinctive of our own and some other countries, it is with still greater hesitation that the subject of teachers, for primary schools, is approached.

To the provision of competent instructors may be traced the excellence of whatever schools are excellent, of whatever grade they may be, and wherever found. To the failure of such provision may be traced the inferiority of whatever schools are inferior, of whatever grade they may be, and wherever found. If the results of acquirement and discipline found in the best educated nations of the world could not be accomplished here, in the given time, with our methods and uncertain attendance, neither could it be here, with their methods and regular attendance, and our teachers. Economically considered, the expense of furnishing first-class teachers to schools otherwise poorly equipped is small as compared with that of schools in other respects well provided, but falling into the hands of incompetent instructors; since the one may to a considerable extent supplement every other lack, while the other will assuredly pervert what he does not know how to use. If, in one sentence, I were required to give what I believe to be the most valuable discovery of the educational world up to this present, it would be, that "poor teachers are worse than no teachers."

Such conclusions according with experience and observation, it becomes our duty to inquire into the means of securing the best teachers for that class of schools which begin the work of education. This inquiry leads to an examination of the results obtained by foreign nations who are reaping the fruits of efforts we are just beginning to feel the importance of making.

The first movement of the German states for preparing teachers to carry out their ideas of popular education, was directly in the interest of that primary instruction it was the policy of these states to make available to, and accepted of, all classes of their people. The foresight that decided upon the qualifications of teachers for this grade of schools is justified by the results to every other—the office of teacher, from the highest to the lowest, having become professional, permanent, remunerative, and respectable. The machinery put into operation to secure these ends, and the care extended to its working, is truly wonderful, considering the time of its inauguration; and more particularly by Prussia, so impoverished and humiliated by the French imperial arms of 1806, which was about the time when the government began to move most actively in advancing all its school interests.

To make it professional, and to give it high tone as such, in addition to the acquirements demanded of those who aspired to the office of teacher, tests were adopted to ascertain the natural aptitudes of candidates for this profession, without which the widest range of scholarship may be comparatively valueless; and it is the practice to discourage all such persons as are tempted to teach as a resource, after failing in other pursuits. After having been accepted as candidates for normal training, each student was required to verify, from time to time during the entire course of several years, his practical ability to make instructions given available to the uses intended, any failure to do which usually put an end to further preparation for an office the individual was not likely to fill acceptably. When graduated from the instructions of the most accomplished teachers of the kingdom, a yet further test of one year as the assistant of an accredited master was necessary to the coveted position; and a failure in any particular here insured the profession riddance of so much incompetency, since no attempt to make up for such failure was ever permitted in a state institution, and no such person was admitted to the staff of public school instructors. Nor ought it to be omitted that any discreditable conduct, any discoverable tendency to moral delinquencies, anything but the tone and practice of a Christian gentleman, was, in itself, a disqualification for preparation or practice in this art of all arts, so cherished and environed by the combined watchfulness of state and church and people. Surely and slowly this trio of powers have co-operated, from that to this time, to raise the standards and improve the methods of qualifying teachers, to the end that the primary instruction of advancing years might keep pace with the growth of national prosperity and the demands of civilization.

To insure all possible permanency to the practice of the chosen pursuit, students in normal institutes were required to register their affirmations of intention to prepare for teaching, as a permanent business, before a dollar of money or an hour of time could be expended in their instruction. Even before the period when age admitted to such opportunities, the recognized code of both interest and honor made it cus-

tomary that the earliest development of preference for this vocation should be made known to the village pastor and the village teacher, to the end that natural fitness for it might be fostered through the years of rudimental study, and the religious character divested, so far as pastoral watchfulness could assist it, of everything that did not savor of Christian virtue, thus strengthening the idea of a permanent position in manhood with the pride of the village and the aspiration of the boy.

When all was done and every test was satisfied, the installation of a teacher into the sacred duties of his office was made the occasion of a civil and religious ceremonial, in which the honor conferred was bound to be the honor of a life-long and beloved profession. Of course the wisdom of the authorities that could take such an interest so scrupulously to its guardianship could also, as it did, provide for the contingencies of a withdrawal from the service when the best good of either the individual or the public demanded it; and so happily have the two been combined that, practically, the government has suffered little loss in out-fitting those whom the fortuities of life have turned from the practice of instructors.

So far, the establishment of this profession has been secured. It must, also, be made remunerative. To this end, a minimum compensation was arranged which has kept a steady advance with the standards of excellence required, and been so supplemented by provisions for accident, sickness, old age, and, finally, for the family left behind when death calls the servant away, that, while the public school-teacher may not often cherish the ambition of living or dying rich, he is placed beyond the possibility of want in anything relating to a comfortable living, both for himself and those dependent upon him. The actual amount of this compensation is determined by the expense of the times and the locality of residence, often a better security than a larger definite sum not considering these circumstances. For this compensation the government is directly responsible, as it ought to be, for the pecuniary support of those it has prepared for so important a branch of the public service; whose authority installs into and out of that service as the public good demands; and whose aim is to so dignify the officials of these positions that they may serve as the immediate links by which the individuals and communities of the entire national domain may be held in grateful allegiance to a furtherance of the national prosperity and power.

Such is the system of Prussia, and, with slight modification, of other of the German and Scandinavian states, for qualifying, retaining, and dignifying the teachers of their primary schools; and such, or something still more efficient, the system I hope to see established in our own country. Interest in normal instruction is being quite generally awakened, and in many of the States of the American Union schools for the training of those who expect to teach are springing up; while institutes for conference and comparison of views are frequently

held in the localities where teachers can conveniently come together, where from days to a week are spent under the direction of the State superintendent of instruction, assisted by such educators and friends of the cause as can be improvised into this service. Great good is thus being done; but mainly, yet, in calling attention to this long-neglected interest, the results of which scarcely touch the actual state of public-school instruction.

It cannot be said that we are without teachers in our elementary schools, whose natural nobleness and Christian character—whose knowledge, discipline, and devotion to their calling, eminently fit them for the posts they fill; but it must also be said that such are so rare as not to form a class to be spoken of. The almost universal habit of placing the children of our country districts under the school management of quite young persons of either sex, particularly if at the hastily-passed-over examinations they have given some pertinent and "smart" answers, and can be had cheap, is most execrable. Placing children in their most plastic conditions of soul and body, with every nerve and sense and faculty keenly alive to impressions, under the tuition of mere children themselves—so far as fitness for this duty comes of experience and matured observation—merely because these persons can follow the questions and answers of text-books, is a crime against the age which sees it, and a crime against the child who is the subject of it, in comparison to which allowing the child to grow up unlettered is excusable. There is no crusade that could be inaugurated on behalf of childhood and its rights so holy as a combination against such practices. Better, a thousand-fold better, send out this army of innocents—children whose early years are not merely defrauded of their most sacred rights, but perverted to irremediable results—to spend their school days amid the novelties and interesting objects of nature; and while they at least invigorate their bodies, let the empty school houses of the land bear the inscription, "Poor teachers worse than no teachers."

Even when you find persons of more mature age in charge of these schools, how much better is it? Instruction may be given in the desired branches; an external discipline of order may be maintained; an educational result of mere intellectual value may be secured; but, as a rule, the sum total of value to the child will be less. And why? This may best be answered by the inquiry, Why is the teacher there? Certainly not because the position is coveted as a choice of pursuits—because the flock is beloved, and each member of it a study to his lively and interested observation—because by the intention of making each year more valuable to them, is cherished the hope of seeing one by one go out with character and acquirement to honor whatever position life may offer. Far enough from all this. I speak of the average when I say that our primary-school teachers are where they are because of the failure to secure something better to do; or as a make-shift, while waiting for something in prospect. As a refuge from disappointed ambitions,

or as a stepping-stone to a position for which he needs a little time and temporary support, this occupation must be, in all vital particulars, less ably filled by those who have years over their heads than by such as are, at the least, nearer the needs of the young in their freshness of feeling and unformed plans.

And who is to blame for such a state of things? The authorities of State, municipality, and home. By the failure of any one of these, and of any combination of these, to define a standard by which qualifications may be tested, to furnish a support by which it may be made remunerative, to create a public estimate of valuation, by which it may be made desirable, the office of primary-school teacher has been left to what it is found to be.

I am half ashamed to do so, but will quote the words which more than twenty-five years ago that noble philanthropist in the cause of education, Horace Mann, reported as his estimate of the general status of the primary-school teacher of Prussia. He says: "In the lowest school of the smallest parish, in the obscurest village, and for the poorest class in overcrowded cities; in the schools connected with pauper establishments, with houses of correction, or with prisons—in all of these, there was a teacher of *mature age*, of simple, unaffected, and decorous manners; benevolent in his expression, kind and genial in his intercourse with the young, and of such attainments and resources as qualified him not only to lay down the abstract principles of the above range of studies, but, by familiar illustration and apposite example, to commend them to the attention of the children." The years between that and this time have been years of vast enlargement and improvement in all that relates to the educated growth of that people, and the observations and reports of to-day are glowing with appreciation of the value and honor of the teacher of their youths.

It is important enough to bear repetition—the hope that something as good as this may be done for the primary instruction of our country. There is no reason why something better should not be done, under our more flexible and generous government, and our institutions whose theories are the envy of the world. Qualifications cannot go too far. The broader and higher the range of culture and discipline the teacher has reached, provided the moral development has been healthy and happy, the more easily is accomplished the work of coming down to and aiding upward the whole being of a little child. In this work the early teacher stands next to the parent; and without these intermediates, of value corresponding to its capabilities, it is utterly vain to look for that quality of worth and usefulness in the after life, else so easy of attainment.

One thing is certain: whatever the standard for qualifying the teacher of our children may be, no standard, however high, for the remuneration and honoring of this office established by other nations will do here. To hold the American teacher to the work of instructing children, a com-

pensation and a credit that will compare favorably with the opportunities that a high order of talent and culture may find in other callings must be established or they can never be secured to this service. Again, a high order of native talent, a liberal culture, a generous remuneration, and an honor equal to the ambitions of the restless, intense, and aspiring character of our young people must be secured, before our children can be brought to properly honor the authority and value the instruction of their elementary school teachers. There is no mistake about it. There is a relation between these things established by mere children, long before we see the danger we cannot then avert, and which influences, as a wise parent would not choose to have it influence, all after development.

II.—SUPPLEMENTARY AGENCIES.

Even in those countries where educational provisions are universal and the reception of instruction is compulsory, education is not the universal result; while in countries where they are partial, and reception optional, the results vary in every degree.

For the naturally endowed, but destitute, supplementary agencies find a very general expression in Sunday schools where, in addition to moral and religious instruction the rudiments of common school knowledge are imparted. Such agencies are always found in factory and apprentice schools that undertake to make up a portion, at least, of that primary education of which early and regular occupation would defraud its subject. They are found in many of those regimental schools where public justice or private philanthropy undertakes to diminish the adult ignorance that has been called upon to defend or enlarge its country's borders without possessing so much as the alphabet of its country's knowledge.

Evening schools are an important feature in the supplementary education of all people who are in earnest in enlarging their educational forces. They are established in towns and cities almost everywhere, and with their multiplication the numbers of each increase. The pride that kept many an ignorant man or woman from an attendance upon these schools by which public admission of ignorance was made, is giving way to the stronger desire of securing the better conditions of means and position. These schools defraud no one; it being conceded that the labor usually counted exhaustive is not so exhaustive, but that the incentives and opportunities of knowledge which in no way diminishes its present remuneration and promises an increase to more intelligent effort are equal to a stimulation of intellectual exertion. The fact that these schools have often to commence at the very bottom of the ground-work of instruction is, in one view, discouraging; but the encouragement of finding the fathers and mothers of children of school age ready to begin the neglected rudiments of their own education balances the prospect. Outside of a thorough and required instruction of the young, there is

no branch of supplementary schools that appears to me so valuable as these evening gatherings of grown-up people, the parents and friends of those children whose education is most likely to be neglected.

Lectures, lyceums, library associations, all hold a high place among the supplementary agencies of ordinary education. Much has been done, but much more remains to be done, to adapt these means of culture to the lowest standard of such as are seeking, through intelligence, a bettering of their condition. The lyceum, too, has its spread and its peculiar uses, and has been already largely introduced wherever a band of from a dozen to twenty persons have been associated together for the discussion of practical questions under the encouragement of a good and intelligent individual. These and related aids are economically suited to supplement the education of any neglected class, and are, to a larger extent than the school reports of many a nation would admit, needed. In our own country they have the recognition of popular sympathy and are somewhat available; but the opportunities are yet large for the combined labor of the authority and good-will of communities to establish such means as may, from these, develop to the great unsupplied want of education. Libraries of useful and attractive information are being founded in the interest of those whose cause all supplemental agencies plead, and for the class now considered—the naturally endowed, but destitute—furnish the most available means within the reach of every community and each individual. Books for the million, as soon as the million knew how to use books, was the call of those who led the warfare of intelligence against ignorance; and books, suited to every class and all capacities, are being piled higher as the worth of man and the uses of life are more recognized.

SCHOOLS FOR THE DESTITUTE AND VICIOUS.

For the naturally endowed, but vicious, both governments and people have always moved more promptly in the directions indicated than for those who, under great disadvantage, have maintained a genuine or a seeming obedience to the laws. This premium, so to speak, awarded to the vices over the needs of ignorance, has a quite remote history. But since it is not proposed to go into a history of preventive and reformatory education for the destitute or the vicious, but simply to call attention to the radical failures of any systems of public school instruction, as indicated by this large range of supplemental aids, preference will be given to those organizations which have served as models to succeeding ones.

In time, the labors of the great and good Pestalozzi for the vagabond and deserted children of Switzerland, in 1775, and of the Netherland Society of Beneficence in Holland, in 1818, preceded the establishment of the *Rauhen-Haus*, at Horn, near Hamburg, in 1833, by Wichern, and the *Colonie Agricole*, at Mettray, in France, in 1839, by Demetz. These latter institutions, having owed their peculiarities of excellence to the growing recognition of the times inaugurating them, in regard to the neces-

sity of more general elementary education not merely provided, but enforced upon the lower classes, very naturally took the ground that education, and not punishment, should characterize all reformatory provisions. They went further; maintaining and convincing by their unparalleled success, in the work of permanent reform, that moral elevation must be in advance of intellectual, at least for the classes they sought to bring in to their sheltering—the most depraved of all that could be found.

Accordingly the inmates of these establishments were divided into families of not more than twelve, each group being under the care of persons whose mission was to combine the discipline of a school and a home, as circumstances would admit. From that day to this, prisons for convicts of youthful age have mainly disappeared from the world, while prisons for adults have universally felt the amelioration of the truth there practically illustrated, that instruction, including labor and affection, not failing of discipline, were to join hands in securing society against crime and in giving back to society the truly reformed criminal. And yet reform schools, and prison schools, what a shadow they still remain upon the school records of almost all countries! In vain the sums of money annually appropriated to their support repeat, in the hearing of legislators, that it is easier to prevent than to reclaim a criminal, and vastly more economical. In vain, or almost, so slowly do fruits of these labors diminish the statistics of vice and ignorance, do the nations assemble in international fraternity to consult how best to convert the necessity of prisons into the opportunities of instruction. No later than in 1855 at Paris, and since that at Brussels, the statesmen and philanthropists of nearly all countries met in this common interest. There is no mistaking the work of the statesmen and the educators who would stand foremost in the history of immediate generations—that of wiping out supplemental and reformatory educational attempts, by devising such means of public instruction as will secure, what has never yet been secured, the education of all who are amenable to law. There is no glory of power and wealth, so considered, that could take from the brow of any people the crown that would accredit such an achievement as this.

For the partially endowed—the blind, the deaf, the dumb, the idiotic—does any one think to place these beyond the pale of a public responsibility, so evident in the cases of destitution and vice? No. The number of those who cherish the delusion that an inscrutable Providence has decreed numbers of innocent persons to a penalty for which there is none but divine accountability, is rapidly diminishing, as science, which has pioneered the way into the hidden treasures of the material world, is piercing with its light of established truths the dark mysteries of social disorder. Sentiment and theology may stand aside. The logic of statistics is showing how closely violation of law is followed by the results of deformity and deficiency; while the same unanswerable

tables, in connection with educational deficiency, tell the story of human wretchedness.

Education for these unfortunates has kept pace with enlightened civilization, and there are no Christian countries which do not supply some means of helping them to a better use of such powers as they have, as a supplement of those they have not. The annual appropriations made for institutions suited to the partial physical endowments of the blind, and of deaf-mutes, are hopeful premonitors of the time when individuals of these classes will be as rarely found as were of old instructions for their special improvement.

SCHOOLS FOR THE IDIOTIC.

The science and beneficence of the times are nowhere more noticeable than in recent efforts for the benefit of the idiotic. The results of educational attempts, for this most unfortunate class of all unfortunates, have already placed the improvement of the idiotic beyond the doubts of controversy; and nowhere else are the related physical and intellectual laws of the human constitution more amply illustrated. This last and most reluctantly entered field of investigation seems to approach, if not to reach, the limit of the operations of the educator.

Idiocy—that condition from which the world has turned with a repugnance that did not shrink from endowments however else partial, nor from the degradations of poverty and vice—the imbecility of which was so much more hopeless than the ravings of insanity—idiocy is at length to have the elevation of a limited yet possible education.

CHAPTER IV.

SECONDARY EDUCATION.

SCHOOLS OF LOWER GRADE—SCHOOLS IN THE GERMAN STATES—SCANDINAVIA—FRANCE, ENGLAND, AND THE UNITED STATES—SCHOOLS FOR A HIGHER GRADE OF SECONDARY INSTRUCTION—GYMNASIA—REAL SCHOOLS—SECONDARY EDUCATION IN ENGLAND—PRUSSIA, ITALY, FRANCE—UNITED STATES.

I.—LOWER GRADE.

Secondary education of some sort has always existed, and has had its place in or out of the plan denominated popular, just in proportion as the line, no less flexible and varying than its boundary, which defined the national idea of popular rights has been liberal or limited. As the truth that a certain amount of rudimental knowledge is essential to all alike took root in the convictions of thinking people all over the civilized world, and that all classes *must*, therefore, have it furnished to them, so, as the facts of this furnishing began to multiply and bring fruits, the still more distinctive truth that, beyond this essential education, all people did not need exactly the same advancing culture, and *might*, therefore, have that which their necessities or inclinations decided as best for them, began to illustrate itself in a class of schools hitherto unknown, and to give to secondary education the honor of verifying its practical value.

Up to this time it had been classical almost to the exclusion from its instruction of those who were not destined for the still higher advantages of superior culture.

The developments of science and ethics brought new ideas of value and duty; and these ideas were soon prolific of action that opened a field of education dotted all over with schools accessible to the mass and varied, almost, as the needs of the race. Anomalous as it may seem, this most remarkable of the educational phenomena of any time—and which has recently received such an impetus that it seems a spontaneity of our own times—had its first and still has its most complete illustration under those governments where the inherent rights of man are less distinctly admitted than in those where both the letter and the practice of the law are a unit in the advocacy of the largest freedom.

As in other great departments of instruction, there are in this gradations that rank as lower and higher, corresponding at once to the general ideas of the countries where they are fostered, and to the necessities of those who seek them.

GERMAN AND SCANDINAVIAN STATES.

Thus, in the German states, where this bifurcation of secondary instruction is most noticeable, the burgh school, which had long existed

as a municipal provision for the highest primary advantage, began at an early day to develop into the higher burgher and the pro-gymnasium; the first in the interest of practical, and the second of classical training, and yet with such a happy combination of each, that the students of neither were excluded from the advantages of the other. This principle seems to have kept pace with the spread of such schools: that while the pupil must have instruction in the direction of his anticipated calling, he should also be encouraged to secure so much of that which is considered culture as his circumstances made possible.

In the Scandinavian states the high, or grammar schools, the citizen's schools and schools of learning, altogether classical in their foundations, began to incorporate such special teachings relating to the business and arts of life as approximated the new demand, some time before the real schools of Denmark and the apologist schools of Sweden (both practical) began to define in distinct institutions the first grade of their two-fold secondary instruction. I have always regarded this necessity, which came of limited means and partial knowledge of how to give the new idea tangible form, as most happy, having prevented the divergence of these paths of special development to such extent as must have greatly lessened the value of each while tending to perpetuate that feeling of caste in society which it is one province of education to banish.

The ripeness of the time which saw the birth of this era in the education of the world is strikingly illustrated in the promptness with which both Russia and Italy began an appropriation of the light it brought to these so opposite civilizations. In the district school of that empire began the glimmer of the torch of science applied to the resources and capabilities of millions who could not hope, and who did not care, to find the old paths to better conditions; while in Italy, the soul of its departed greatness seemed to inspire the degenerated population with the thought that practical business education was the speediest road to the material power which must precede a recovery of the old prestige. To this end technical schools of number and variety equal to a stimulation of great national activity chronicled a very considerable advance in this grade of secondary education over that of most other countries. Switzerland is not behind in the supply of either classical or scientific secondary education; though the independence of the several cantons would make reference to any detail of differences tedious. In Belgium a very marked advantage to the people is dated from the establishment, in 1850, of intermediate schools of higher and lower grade, in each of which there is a section for instruction in courses leading to collegiate and to business life, which may be pursued together, or singly, at will. In truth, scarcely any of the most inconsiderable powers of Europe have not taken steps to secure to their people, the masses of whom have hitherto been either limited to primary or forced into exclusively classical instruction, the facilities of preparation, in some degree, for the varied occupations of practical life.

FRANCE, ENGLAND, UNITED STATES.

Three great names—France, England, and America—by their comparative inaction in this interest stand grouped together; not that they have left secondary education unprovided for, but that they have more slowly come to a recognition or a supply of its needs, as above indicated.

Though the people of the French empire have been for a third of the past century calling for a better and more popular middle class instruction, and though some considerable improvement has in both public and private ways been made, the educational forces of the government have been mainly directed to redeeming its low estate of primary, and ministering to the furtherance of its superior instruction. The communal college is yet the only public institution providing secondary education to the great mass of the people; and between this and the parish school there is a chasm that most of those entering upon ordinary labors and business pursuits do not know how to bridge. A real school of some sort, a citizen's school, a pro-collegiate course, coming down to the wants of those who may not go further, and more directly assisting those who, under difficulties, may, is still the great lack of their system of public instruction. An attempt has been made to meet this demand by incorporating courses of practical scientific value with the more classical curriculum of these colleges, and to give to these courses the desired grades by doing the same for the smaller number of royal colleges. Less than this has been done by England in connection with the burgh Latin and inferior grammar schools, which have yet kept up their classical front in lower, secondary grades.

How far the American high school, which, as a national institution, stands in the lower grade of secondary education, meets the requirements of our youths, so anxious to get ahead and so convinced that success in business is the measure of this, is a question that would be variously answered by educators. That they do meet this world-noticed popular move in the direction of encouraging and respecting special training, for special ends, in any way befitting the versatility of our genius, the magnitude of our undeveloped material wealth, and this epoch of our national history, I think few would affirm.

The Scandinavian states, the German, with most of the smaller European states, and Italy, have adopted courses of study for a more varied and thorough secondary instruction, giving to its lower grade a dignity and value which can only come of time and care not usually bestowed upon this beginning of the more individual training of the young. In the first intermediate schools of these countries will be found a fair illustration of the old axiom, "that worth doing at all is worth doing well;" and accordingly, whether providing for separate or combining instructions for the varied positions of life, the scholar is often reminded by the course and by the time required that a fitting for life has really commenced. The positive nature of the governments by which these schools are fostered, and of the people whom they educate, finds expression in

the reluctance with which things esteemed valuable in the more established schemes of instruction are let go for the sake of the new and importunate values of the present.

In contrast to these countries, England stands, for a great nation, quite alone in indifference to any popular claim, adhering to the exclusive classical character of its middle schools. Two reasons seem to justify this—the ancient endowment of many of these as grammar schools for the distinctly named purpose of preparing pupils for "ye universitie," and the result of a high classical tone of culture to such as belong to the best educated class. Many reasons, based upon both the justice and the policy of the case, could be brought to the other side, while the reports of the royal commission, of 1864, upon the condition of these grammar schools—originally founded for the classical training of poor and meritorious youths—are valuable in testimony favoring a remodeling of the entire system of them as grammar schools, and supplementing the demand they do not meet by such a middle-class school instruction as may begin to convert educated labor all over the kingdom to the account of national wealth and honor. Here, as in no other country in the world, secondary instruction of both grades has been, and up to this time remains, almost exclusively in the interest of that limited number who are to enter life with superior culture.

The lower grade of secondary education in France and in America is near together, not only in value but in the mode of reaching it. Endeavoring to avoid the example of their English neighbor on one hand, and without the cost and delay incident to adopting that of their German friends on the other, these countries have sought to secure such a beginning of secondary instruction as was indicated in the developments of recent years by additional courses in such schools as stand next to the higher primary. But these people, so little alike, and yet so much alike, in their impatience of delay, have measurably defeated these ends by crowding the communal college of the one and the high school of the other with studies beyond the time allowed. In this mistake France has rather the better of us, since there is a division of communal college labor and certificated credit such as our high schools have not provided. The youth who has been "put through" this school of ours, which is high in aim and often low in results, must go out with the credit or discredit of the whole gained or the whole lost, notwithstanding the fairest possibilities of future superiority that have been blighted by the excessive toils that won, or the mortifications of disappointed effort.

If the modern languages, mathematics, elements of design and drawing, of chemistry and physics, which make so much better front than formerly in these colleges and these high schools, could displace, a little, the older and more classical curricula of these schools; or, still better, if both together could gain time for a more extended good-fellowship, neither country would be so badly off while waiting for public need to

work out a scheme of secondary education that should combine the best of the old and the new ideas.

Thus, briefly, has been given a general statement of the status and prospects of lower secondary education for the countries where it is most distinctly provided as well as of the more recent features of its severance into paths leading to practical and professional life.

The whole s bject opens up as of yet but partially recognized importance. As in the case of widely different interests, so, here, the finishing is virtually provided for if the base is well laid. The base, or first grade of secondary education in our country, is not well laid. It is not broad enough to embrace the daily needs of those who crowd its precincts without being led by its instructions in the directions that make the bread of labor sweet and respectable.

II.—HIGHER GRADE OF SECONDARY EDUCATION.

Advancing to higher intermediate education, the path is better provided and more defined. The Scandinavian states having commenced the improvement of incorporating physical studies with those of their grammar schools and schools of learning, have somewhat raised the standard of these while establishing a creditable grade of real and apologist schools in response to the popular call for both sides of secondary instruction. A still more noticeable advance has been made in Germany and neighboring states by the multiplication and increasing excellence of both practical and classical schools, until the real schools and gymnasia they foster, as a part of the recognized public-school system, cannot but be ranked foremost in what the world is to-day providing as the best of higher secondary instruction.

Modifications had been made in the course of studies for a gymnasium, at various times, tending to a recognition of that popular want the great German pulse has always been so quick to indicate. As early as 1812 the director of one of the most valuable of these institutions, in a publication connected therewith, says: "Though the gymnasium is a school for classics, and its instruction must tend to this object from the lowest to the highest class, yet consideration must be had, in the present condition of school matters, that those who intend to become tradesmen, mechanics, and artists, in the widest sense of these words, should be thoroughly prepared for such vocations." In 1831 the official language of the department of education announced that "it is a proposition void of all foundation, that instructions at gymnasia should be calculated for a course at universities only, and not in aid of the development of every mental faculty." The history of these times is full of interest, as illustrating that wonderful blending of the conservative and liberal qualities of the German character, and in no others more manifest than in things pertaining to the subject of popular education.

As now standing, and from authorizations as recent as from 1856 to 1860, the course of instruction at a gymnasium includes the following

branches, with their allotted time, during a period of nine years; the first three classes (beginning with the highest numbers) having one year each, and the last three two years each:

Instruction in the gymuasium.

Subjects.	Hours per week for each class.					
	VI	V.	IV.	III.	II.	I.
Religion	3	3	2	2	2	2
German	2	2	2	2	2	3
Latin	10	10	10	10	10	8
Greek	....	.....	6	6	6	6
French	.....	3	2	2	2	2
History and geography	2	2	3	3	3	3
Mathematics and arithmetic	4	3	3	3	4	4
Natural philosophy	....	.....	.....	.....	1	2
Natural history	2	2	.....	2	.....	.....
Drawing	2	2	2	.....	.....	.....
Penmanship	3	3	.....	.....	.....	.....

Provisions are made for instruction in the Hebrew language and greater proficiency in drawing, if desired; also for singing and gymnastics, out of regular hours. Writing and speaking in the classic tongues, and conducting final examinations in Latin, have the authority of old custom, and, in general, are strictly adhered to, as may be judged from the amount of time devoted to these studies. So faithfully are the ancient standards of these schools maintained, that private and unpaid lectures in them—upon the classics, and upon subjects relating thereto—are quite frequent; and the last words of the teacher to the taught, as he goes out to the larger opportunities of study or of life, are usually to inculcate unremitted exertions to classical attainments.

Of contemporary date, a course of study in first-class real schools embraces the following range of study, with time, &c., arranged as follows:

Course of study in first-class real schools.

Subjects.	Hours per week for each class.					
	VI.	V.	IV.	III.	II.	I.
Religion	3	3	2	2	2	2
German	4	4	3	3	3	3
Latin	8	6	6	5	4	3
French	......	5	5	4	4	4
English	......	......	......	4	3	3
Geography and history	3	3	4	4	3	3
Natural history	2	2	2	2	6	6
Mathematics and arithmetic	5	4	6	6	5	5
Penmanship	3	2	2	......	......	......
Drawing	2	2	2	2	2	3

From this it will be seen that the real is not a "technical school," from which Latin is usually excluded, having derived its name "*real*" from that foundation laid in 1747, by Councillor Hecker, who established a joint school of learning and of arts from which, in their severance, have sprung the famous Frederick William Gymnasium and the Royal Real School of Berlin, the avowed purpose of which, in its departmental organization, was, "that pupils should be taught not by words merely but by *realities*, explanations being made to them from nature, from models, and plans, of subjects calculated to be useful in after life." The differences, as well as the harmonies, between these schools are worth considering.

The declared end of the real school is, "to prepare, by scientific education, for those higher vocations of life for which academic studies are not required." And yet it is further said that "the practical requirements of the time are not a measure for their organization, but the object to develop the mental faculties of such youths as are intrusted to the teaching of these schools to such a degree as will fit them for an independent realization of the duties of life; and that, like the gymnasium, they must work by general means, while dividing between themselves the elements of that complete instruction which pertains to the different professions and pursuits."

The good-fellowship existing between these now distinct classes of schools is shown not only by their courses of study, by their directors—sometimes the same person—but by their time-tables arranged for the economy and convenience of both. The real school begins lower down and stops three years short—receiving pupils at seven, and sending them out at sixteen years of age; while the gymnasium receives at ten, and dismisses at nineteen years of age. Having the same elementary basis, it is from the first year of the gymnasium and third of the real school that a divergence begins; but, even here, not so great but that the pupil of the latter, by giving proper attention to Greek during the seventh and eighth years of his study, (fourth and fifth of the former,) may, at the conclusion of his eighth real year, pass into the sixth of the gymnasium and there continue his studies until the conclusion of the time and course.

These institutions, the gymnasium and the real school, are the pride of the German people; and well they may be, for in no schools in the world are physical, intellectual, and moral discipline so admirably harmonized, and made effective in the great work of developing and furnishing the youthful intellect with the implements of future possibilities.

ENGLAND.

The higher secondary education of England needs but reference to the fact of its exclusively classical character, found now, as in the past, in a number of its better endowed and administered grammar schools, and its great public schools which take rank with some of the colleges of

other countries. Great scholars and good men have adorned and blessed the race through the instrumentalities these schools have furnished their native genius and inherent worth. In the interest of this special department of education, a bare reference is made to exhibits believed to be largely attributable to the school policies of two countries, one of which has done the most and the other the least toward popularizing it, before passing to a review of such as take middle ground.

It was about the year 1806 when, with a population of 10,000,000 and embarrassments of poverty and humiliation such as few nations have ever met, Prussia began, in earnest, to devise and make available to a suffering people the scheme of public-school instruction which challenges the admiration of the world, and which, in the fifty years between that date and 1856, brought to its 17,000,000 of people an income of more than three hundred per cent. over that of the former, resulting from an improved agricultural industry and a manufacturing wealth apparently created, as its political economists declare, "out of nothing."

In 1818, with a population something over 11,000,000, the expense of pauperism to the English government was little short of £8,000,000. In 1859, with a population less than 20,000,000, the percentage of paupers in England and Wales was 4.6 to the whole number, and the expense of these in the pro rata of 5*s.* 6*d.*, ($1 37,) and costing the government, in connection with special aid from the city of London, scarcely less than £10,000,000. Between these dates, 1833 saw the first public grant to elementary instruction in the pitiful appropriation of £20,000, annually, for a term of five years.

While the public economist is figuring the totals of these and bills of expense that cover the "poor rates" of intervening years, the public educator may be permitted to speculate as to the probable results had these sums been exhausted in inaugurating and encouraging the educated labor of the lower classes.

RUSSIA, ITALY, FRANCE.

In the higher grades of intermediate education, the gymnasium of the German system is reproduced in Russia and Italy, as in many of the countries not specifically mentioned, and with such differences of completeness as might be expected of their various political and social states; but, wherever found, always ministering to classical proficiency in still superior culture.

In Italy and France, lower intermediate education, whether in practical or classical directions, finds the higher advantage of both in the lyceums where general courses of instruction are arranged, including well selected and greatly advanced branches from both. There, too, are found special courses for each, embracing what is esteemed most valuable for the end sought.

A general course, in a lyceum for either country, includes a thorough course of Latin and Greek, with some optional modern language—usually

German or English—rhetoric, philosophy, national literature, civil history, mathematics, and a wide range of the natural sciences. The time required for such a course is usually six years, after the ordinary preparation of from two to three years in some lower secondary school, bringing the youth to his eighteenth or twentieth completed year of age, according as preceding instructions have advanced or delayed him. The earlier French requirement that a student having completed this general course, and passed examination, must give an additional year to the study of philosophy, and, after that, the same to the higher mathematics, before receiving his degree of letters or of arts, has been so modified that it is not a public-school requirement, but an advantage which, if secured by the required time and labor, is recognized in the certificate of dismissal. It is also of more recent adoption, in both France and Italy, that the certificate of completion in the scientific course, which was formerly dependent upon that of letters, having been attained, is now independent of it and secures to the holder of this alone, as of that alone, equal opportunities in the military and postal service; though neither, separately, gives the advantage of a general certificate in the wide range of opportunities that lie between those and the superior positions of the highest professional callings.

All these, and numerous other institutions which, like the lyceum, gymnasium, real schools, and schools of arts, are scattered all over the continent, are not encouraged, alone, but are supported mainly—often wholly—by the governments where they are fostered. As such schools have multiplied, the power of the government to elevate the populace has increased, and the wealth of the people to maintain the elevation.

UNITED STATES.

A review of the superior intermediate education of the United States has been left out of immediate connection with that of other countries, because it is not here, as a whole, nor yet in any of the several States, a part of our public-school system.

The public high school has been noticed as belonging to the lower grade of secondary institutions, and such it is, and must be, so long as it remains the next advance to the higher primary school. But to draw a line, placing all of our public high schools on this level, would be unjust to those that rise quite above the average, challenging comparison with our incorporated academies, and such schools of isolated eminence as embody our most advanced ideas upon this subject. These higher high schools, these academies and schools, of whatever name, that lead the advance of our secondary instruction, are, in fact, equal to some of our colleges.

For schools of the class above indicated, pages would be needed to allow them so much as a mere honorable mention; while to give a fair idea of the educational value of any considerable number of them would lead to a list of organizations, studies, methods, results, endow-

ments, &c., which would minister to the pride which an American naturally feels in the munificence of our school provisions, both public and private, but which provision is still, without doubt, most unequal to the popular demand, as is the education it furnishes for the outlay actually made. How can it be otherwise, when no two of the States, and no two of the great public high schools of the same State, are a unit in anything relating to their interests, the same variety extending to the entire range of incorporated academies and individual seminaries, of every rank between the high school and the college proper? The youths whom the fortunities of life have thrown upon their own judgment are left to the complexity and perplexity of endless comparisons of value in the institutions that offer their services in this department of instruction, which is the finishing up of the educational tuition of by far the largest number of those who represent the intellectual wealth of the country. The delays of choice result in loss of time; while choice is often the occasion of vital mistakes and loss of opportunities never to be regained, to say nothing of the mere pecuniary extravagance of frequent and wholly useless change of text-books, and the material appliances of the courses of study selected. From this, too, come those false estimates which often accredit superficiality, and make ignorance respectable in the responsible positions of home, school, society, and state. There is no advocacy of the favorite notions of any leader of reform in our school policy, much less that wisdom dictating a uniformity such as the examples of various nations furnish, in suggesting, as the best that can be done, and that ought soon to be done, a standard below which the higher grade of secondary instruction could not be permitted to fall. Accordance of standards could, no doubt, be easily secured in all the educating States, and any lower than these would scarcely be thought of in those that must ere long inaugurate some schemes for the neglected instruction of their communities. By such an accordance as this, secondary education would emerge from the misty atmosphere of uncertain value, which now surrounds it, to a dignity appropriate to its end, and to the position of that immense number of persons who depend upon it for the limit of their school advantages.

Under the present independent organizations just referred to, a wide range of acquisition is attempted, and a very respectable degree of discipline secured considering two very radical mistakes—the inadequacy of time allowed and the immaturity of age on dismissal—to be hereafter noticed. This range of acquisition embraces, very generally, that element termed "popular," that has in recent times revolutionized the secondary education of the civilized world. Next to, and almost coincident with, the recognition of science as indispensable to the business of life, and valuable as an educational aid, by the great Germanic confederacy, its claims, in both regards, began to be advocated by the good and far-seeing leaders of the school fortunes of our young republic. The fact that the nations over the sea have pursued so much more positive

courses of action, in giving these truths distinct organizations, arises from a combination of circumstances and conditions that were not found here, but something like which are coming to be more imminent and are only to be met by these or better ways in the same general direction.

It was the present century that began to press the need of this accessory to our school instruction; and before the first third of it had passed, the gracious liberality of such men as Phillips, and Lawrence, and Peabody, and those illustrious many more who gave of princely fortune or personal sacrifice to the endowment of schools where not alone were to be found "the advantages of general higher culture, but a fitting for the purposes of life," called out the championship of eminent classical scholars, such as President Wayland, Edward Everett, and Horace Mann, in favor of a more universal incorporation of scientific and mathematical studies in all schools above the primary. As a consequence, it is to-day hardly respectable for the scholarship, or safe for the pecuniary interest, of a school to announce itself as exclusively devoted to classical instruction. To be sure, such honorable exceptions as the Boston Latin School stand secure, as the intelligence of the community sustains it; but right there stands, also, the English High School, not unfrequently named by foreign educators as the model school of American development. The great, free academies of Norwich, Connecticut, and of New York City; the Public High School of Philadelphia; the most excellent old and new Woodward and Hughes High School of Cincinnati, and the high school fostered by the generous purse of Chicago, all provide, besides a very liberal general course of substantial classical and modern instruction, special courses of classical, scientific, and normal value. In these schools, and in others like them, are found theoretically, and to some extent practically, an encouraging growth in the valuation of music and gymnastics, as aiding both soul and body in the work of development.

Growing out of these more excellent examples, schools that bear the same titles, but with greatly inferior equipments, undertake to do the same work; while not even these last give the time that enables pupils to make thorough work of making their own both the knowledge and the discipline that would otherwise be secured. If, in an exceptional case, these are secured, how often does it prove to have been by making thorough work of undermining all possibilities of future usefulness by hopelessly impaired health? From three to five years—the average is less than four—are not enough for young people of either sex, and of fair physical conditions, to secure the advantage now offered by the courses of instruction in a first-class American high school or academy; much less will it be sufficient to the added value of these courses, as they adapt themselves to the growing demand for more thoroughness in the general, and more utility in the special tuition given. The time would not be equal to the range already given in letters, physics, and art, were the young people of our more advanced school population shielded from those encroachments that the social life of home and associated amuse-

ments now thrust upon them. It is not that the home or the community furnishes too much relaxation; but that the unseasonableness of such privileges and such hours as they require make them a tax, rather than than a recreation, to the youthful mind and body.

To "make haste slowly" should be the maxim of school, and the maxim of home, until, by incorporation into the very being of the individual, it comes to be the habit of life.

Of our secondary instruction, it cannot be said to be gratuitous, as is the primary, wherever the provisions for it have been accepted; but its expense is so reduced by reason of being largely furnished in institutions founded upon the liberality of private means, that a reference to the total of these contributions is due to the benefactors, as the cause, of this department of our popular education.

An approximate of $100,000,000 is doubtless within the limit of actual fact as an endowment of secondary and superior instruction in the various institutions that have been the recipients of individual bounty. From latest reports, the income of academies and secondary schools from such sources, as compared with that of higher institutions from the same, is as five to two.

The latest returns of the whole number of students in higher secondary, as compared with those in college and university courses, is as ten to one. Partial but later returns from various parts of the country show an increase in the patronage of intermediate schools by that exceeding generosity that has marked the recent years, no less than the wisdom of the direction this stream of private benefaction has taken, by the still larger proportion of pupils found in our middle range of instruction.

Leaving out of consideration those public schools of this grade where instruction is on the same terms of entire gratuity as in the common school, and those conducted as sources of profit by individuals or corporations of individuals, it would not be extravagant to make the reduction of from one-half to two-thirds of the expense of academical education, as due to the endowments originally made or since received.

In some it is gratuitous by terms of the grant—the localities to bring up the deficiency of any needed sum to maintain the efficiency of the school—open to any who seek admission. In others it is gratuitous to the extent of a given number of scholarships for the more needy, while such as are able pay full tuition. Again, localities are bound to keep the institution in buildings and in whatever relates to the outfitting, while the endowment income is applied to enlarging and paying for appropriate courses of instruction. In many instances these schools have annual appropriations, thus bringing the treasury which comes of the wealth of the state to bear upon the intelligence of a community that needs it, without recourse to a local tax. As in my judgment the wisest, and most in accordance with our educational theories, Massachusetts, at an early day, set the example of taking all incorporated academies into the scheme of its public school instruction, and so fostering

that advancing culture which the larger elementary education of this pioneer State made earliest noticeable.

While I would be far enough from indorsing the opinion of a recent writer upon academic education by the statement that "these intermediate schools are the place for a majority of our young people who have no need of higher culture, and have no business in college," I would take the ground that the majority of our youths, of both sexes, find it convenient to limit their school-training to the courses here pursued, and that the course of study in a first-class American academy is often equal to that of an American college. If, in a given case, an academic is equal to a collegiate course, the ambitious student who goes out from the former has this advantage over the latter—that of being more likely to remain a student, and so rise to eminence in any chosen pursuit, because of a need he seems himself to have, in having missed a collegiate course; while the possessor of such honors, resting too frequently upon them, does not rise above the scholarship of his graduation.

In conclusion, the aim of primary instruction, to furnish the essentials of human knowledge to all, whether they are individually to do anything or to become anything but human beings or not, is scarcely more worthy or likely to find a speedier realization than that of secondary education, to furnish the class—only less numerous than all—who are to do something, and who must become something whereby to live, with a knowledge of the best ways of converting the sweat of the brow, the craft of the hand, or the skill of an art into the resources of a contented and honored life.

And not this alone. The aim of secondary education will not be high enough until it reaches and keeps the steady mark of an endeavor to combine the demands of a general liberal education with practical training for the duties of civil life.

I said "in conclusion," but find myself loth to leave this subject, which has been considered not only educationally, but also in the light of governmental exigencies and popular demands, without affording both sides of its controverted values a fair opportunity of comparison. It is not true that scientific study has had to force its present school recognition against the opinions of the world's ablest thinkers. While it has had the opposition of able men and the prejudices of caste to meet, it has also had the aid and stimulation of encouragement from high authorities of both classical and scientific culture as to its disciplinary value; while from both sides has come a unity of evidence as to the value of the fund of knowledge it brings.

From a wide range of testimony that could be indefinitely accumulated, it is proper and of use to consider the words of a few, in our own and foreign lands, most of whom are men eminent in classical attainments, before passing a final judgment upon a point so vital to the interests of our people.

A few years ago, in a letter to a friend who sought advice in regard

to the establishment of a college of secondary rank, Sir John Herschel says: "A good, practical system of public education ought, in my opinion, to be more real than formal; I mean, should convey much of the positive knowledge, with as little attention to mere systems and conventional forms as is consistent with avoiding solecisms. This principle, carried into detail, would allow much less weight to the study of the languages than is usually considered their due, while it would attach great importance to those branches of practical and theoretical knowledge whose possession goes to constitute our idea of a well-informed gentleman. In a country where free institutions prevail it would seem to me that some knowledge of political economy, of jurisprudence, of trade and manufactures, is essentially involved in the notion of a sound education. A moderate acquaintance, also, with certain of the useful arts, such as practical mechanics or engineering, agriculture, draughtsmanship, is of obvious utility in every station in life; while in a commercial community the only remedy for short-sightedness to best interests seems to be to inculcate, as a part of education, those broad principles of interchange and reciprocal profit and public justice on which the whole edifice of permanently successful enterprise must be based." And further, he says: "I should be the last to depreciate the value of classical scholarship; but it is bought too dear if obtained at the sacrifice of improving the general intellectual character by acquiring habits of concentrated thought, and by accustoming the mind to the attitude of investigation and induction while it is yet plastic and impressible."

In a discussion of the educational values of the extremes of scientific and classical culture, and which is conducted with that broad and truly catholic spirit characterizing this great man, Dr. Wayland asks: "Is it possible that our brief probation on earth has been furnished with these two kinds of antagonistic knowledge—one necessary to the attainment of security and happiness, but incapable of nourishing the soul; the other tending to self-culture, but leading to no single practical advantage? Are we to believe that the many are to labor, by blind rules, for the good of the few, who, learning nothing that can promote the happiness of the whole, are building themselves up in intellectual superiority? Is it not rather the intention of the All-wise that all intellectual culture shall issue to knowledge that will benefit the whole, and all knowledge properly acquired tend to equal intellectual development?"

From an address delivered by the late Prince Albert, at Birmingham, the following words are quoted: "No human pursuits make any material progress until science is brought to bear upon them. The laws of grammar, which find their purest expression in the classical languages, are important studies in training and elevating the mind, but they are not the only ones; there are others whose knowledge we cannot disregard, and whose discipline we cannot do without."

In an address on "integral education," by Dr. Hill, president of Harvard University, these words are found: "By confining children to books

and withdrawing them from visible objects their powers and capacities are not tested. Errors come less frequently from illogical reasoning than from inaccurate observation. A witness who can state clearly what was seen and heard is rarer than a sound lawyer or judge. If education is to develop the mental powers, it is also to open a field for their exercise. I doubt whether any training can materially augment the actual strength of imagination, or reason, or any other mental faculty; but I do not doubt—on the contrary, I earnestly maintain—that education may give a man such skill in the use of his faculties that, for all practical purposes, they will be ten-fold their original value."

Lord Macaulay, learned and elegant in the scope of his scholarship, in an "Essay on the Athenian Orators," gives his view of an exclusively classical course of instruction: "Modern writers have been prevented by many causes from supplying the deficiencies of their classical predecessors. At the time of the revival of literature no man could, without great and painful labor, acquire an accurate and elegant knowledge of the ancient languages; and unfortunately those grammatical and philological studies, without which it were impossible to understand the great works of Athenian and Roman genius, have a tendency to contract the views and deaden the sensibility of those who follow them with extreme assiduity. A powerful mind which has been long employed in such studies may be compared to the gigantic spirit in the Arabian tale, who was persuaded to contract himself to small dimensions in order to enter within the enchanted vessel, and when the prison had been closed upon him fancied himself unable to escape from the narrow boundaries to which he had reduced his stature. When the *means* have long been the objects of application, they are naturally substituted for the *end*."

The above testimonies have regard to the disciplinary value of scientific studies, to which is added evidence from men who are distinguished in both letters and science as to the comparative values of both discipline and knowledge resulting from the exclusive or the related studies of these two great departments of human learning.

From John W. Draper, author of the "History of the Intellectual Development of Europe," and now of the University of New York, we have this: "Education should represent the existing state of knowledge, but in America this golden rule is disregarded. Here, what is termed classical learning appropriates to itself a space that excludes more important things. This arises from the circumstance that our system was imported from England. It is a remnant of the tone of thought of that country in the sixteenth century—meritorious enough in that day, but not in this. The vague impression that such pursuits, and such alone, impart a training to the mind has long sustained this unwise course. It also finds excuse in its alleged power of communicating the wisdom of past ages. The grand depositories of human knowledge are not the ancient but the modern tongues. Few are the facts worth knowing that are to be exclusively obtained by a knowledge of Latin and Greek; and

as to mental discipline, it may very reasonably be asked how much a youth will secure by daily translating a few sentences of good Greek and Latin into bad English. Whether for discipline or for furnishing, so far as preparation is required for the subsequent conflicts of life, tradition has been made to confront discovery."

After giving his idea of the discipline of classic studies as a pursuit, Lord Macaulay says further, in regard to the knowledge thus gained: "A scholar of great learning recommends the study of some Latin treatise, of which I now forget the name, on the religion, manners, government, and language of the early Greeks; 'for there,' says he, 'you will learn everything of importance that is contained in the Iliad and Odyssey without the trouble of two such tedious books.' Alas! it had not occurred to the poor gentleman that all the knowledge to which he attached so much value was useful only as it illustrated the great poems which he despised, and would be as worthless for any other purpose as the mythology of Caffraria or the vocabulary of Otaheite."

In "Lectures on History," Professor Goldwin Smith thus balances the reasons for and values of classical and modern culture: "When education was classical, classical learning was not then, as now, a gymnastic exercise of the mind in philology, but a deep draught from what was the great and almost the only spring of philosophy, science, history, and poetry. It is not to philological exercises that our earliest Latin grammar exhorts the student, nor is it a mere sharpening of the faculties that it promises as reward. It was to open a great treasury of knowledge and wisdom as the meed of the student's labor in those days, and which our days, not degenerate from theirs in labor, are directing to a new prize. In choosing the subjects of study, if you desire any worthy and fruitful effort, you must choose such as the world values, and such as may receive the allegiance of a manly mind. It has been said that six months of the language of Schiller and Goethe will now open to the student more high enjoyment than six years' study of the languages of Greece and Rome. It is certain that six months' study of French will now open to the student more of Europe than six years' study of that which was once the European tongue. There are changes in the circumstances and conditions of education which cannot be left out of sight, and which must be taken into account when we set the claims of classical against those of modern culture."

From evidence given before the English public schools commission, of recent date, and embracing a great number of men distinguished in the various walks of learned life, that of W. B. Carpenter, registrar of the University of London and member of the council of the Royal Society, is given, for the reasons that he is widely known in our country as the author of standard physiological and related works, and that his testimony covers a wider range of inquiry in all that pertains to science as an educator than that of any other person with whose views I am acquainted. The questions of the commission are distinctly stated, and

are substantially these: whether Mr. Carpenter had been able to form any opinion as to the comparative value of scientific and mathematical studies in the work of mental training; whether a training of mathematical and classical studies combined would have an advantage from the addition thereto of the physical sciences; at what age such studies could most profitably begin, as compared with classical studies, and whether the power of sustained attention, in quite young students, would or would not be damaged by early interest in physical studies; whether he spoke from experience, from observation, or from both, in his estimation of the inherent value of those studies, as of the ages when they should begin.

To these inquiries the responses were made in great detail and clearness of language and illustration, and, as briefly as they must be given, were to these conclusions: that the physical sciences and pure mathematics had each a quite different function in the work of mental development, and that neither could be omitted, without distinct loss, from a public-school education; that when the classics and mathematics were combined, the discipline secured is one-sided, the physical sciences calling into exercise a set of mental powers, and combination of powers, that neither the pure classics nor the pure mathematics, singly or together, can develop and train; that a good teacher and a good method will find no difficulty in securing the sustained attention of even a quite youthful student, while presenting a variety of the objects and the facts of nature—perhaps not so much as in keeping this attention directed to the study of a book; and that, if intended as a specialty, classical study is not damaged by the delay of a few years, as would be scientific study, specially considered—the faculties by which scientific observation and analysis are carried on being of earlier development; and that, general culture or superiority in both being sought, a fair discipline and furnishing from the studies of physical science ought always to precede the study of letters, as such; that he had, personally, a very high appreciation of the value of classical studies, not that he so much liked them in the days when he had been required to give them what he had since come to feel was a precedence, and an amount of time they did not merit; but that, liked or not, he would not advise leaving them out of the general training of the young, while, in youth as in advancing years, he would see that they did not defraud those mental faculties that ought first to have development in the studies that brought them into active use, and that ought, through the entire educational process, to be enlarged by the continued pursuit of those branches that are their legitimate field of research and application.

SUPERIOR GENERAL EDUCATION.

CHAPTER V.

SCHOOLS OF LETTERS, SCIENCE, AND ART.

SCHOOLS OF LETTERS IN ENGLAND—FRANCE—ITALY—SWITZERLAND—UNITED STATES—SCHOOLS OF SCIENCE—SHEFFIELD SCIENTIFIC SCHOOL—LAWRENCE SCIENTIFIC SCHOOL—FACULTIES OF PHILOSOPHY IN EUROPEAN UNIVERSITIES—FRANCE—ITALY—GERMAN STATES—GREAT BRITAIN—SCIENCE AND ART DEPARTMENT—SCHOOLS OF ART.

I.—SCHOOLS OF LETTERS.

The secondary education, of which notice has been made, was marked as being in its higher range the outward limit of instruction in the schools found possible to any considerable portion of the people of even the most advanced country. The superior education of a people, however it may compare with that of other nations, is found in that highest culture furnished as a basis for life, or the pursuits of life, which any of its institutions of learning, not professional, may provide.

At first, when the total of human knowledge was narrowly limited, not only in range, but in the number of those who possessed it, this superior education was of but one order and was known as philosophy; the instruction given to such rare seekers after the higher knowledge as gathered about the philosopher in academic grove or temple porch to receive it, consisting chiefly of the principles of social life, of poetry, of rhetoric, and of geometry. As, in course of time, knowledge spread into countries other than those in whose language the best models of poetic composition, the profoundest doctrines of social and political philosophy, and the highest attainments in geometry were embraced, the study of language also had a place in the highest schools, which then became schools of philosophy and letters. But at length the borrowing nations produced new theories of philosophy and new models which, in turn, required to be studied, and thus, by multiplication, the study of language occupied so large a place that the order was reversed, and the schools of philosophy and letters became schools of letters and philosophy. This last form they preserved throughout the Middle Ages, and this they maintained, without modification, until the finding of the keys to the arcana of nature resulted in opening new fields of study and brought innovations upon the old order of things.

At first, the demands of science were only for a single place in the great schools, from which to teach its new revelations. But no sooner was this granted, than it demanded another, and another; and so grew

up that struggle between the humanities and the sciences which to-day constitutes the most interesting phenomenon of the educational world, and presents that most difficult problem for its solution, to which reference has already been made under a previous head.

As might have been anticipated, the result of this contest, so far as it relates to the superior schools, has been various in the different countries; the encroachments made by science having been determined in character and extent by the intellectual stamp of the people, the degree of social development, and the material conditions involved.

ENGLAND.

In England, parent of the new philosophy and of some of its most distinguished promoters, the resistance has been more marked than in any other country of Europe; and innovation has been less successful. The thick walls of Cambridge and Oxford, for centuries the defense of scholasticism and monasticism, long held out in proud defiance against the invaders, in spite of the battering rams of their mechanics and the yet more dangerous compounds of their chemistry. But neither the one nor the other of these strongholds has entirely held its own. At Cambridge the sciences entered by the unbarred gate of mathematics; and Oxford, at last alarmed by the multiplying hosts that gathered for a final assault, has also made partial and conditional capitulation; admitting only a few of the invading chiefs to its inner courts and prouder halls.

But even now, the physical and natural sciences do not breathe freely in their new homes. The humanities are not only still dominant, as they probably always will be, but treat the sciences with a certain proud imperiousness that ill comports with comfortable, much less equal, association. These ancient schools are still the great schools of letters in England. From their halls of classic culture, and from the like schools in Scotland and Ireland, for many centuries have gone forth a multitude of those orators, poets, philosophers, and statesmen, whose surpassing genius, disciplined and perfected by scholarship, has given to the world so many of those great productions of literature, science, and constitutional law which are at once the richest legacy and the highest glory of humanity. It is natural that such schools should be cherished by such a people, and that change of any sort should seem a desecration.

The present status of Cambridge and Oxford is more nearly that of a college (using that term in the English and American sense) than formerly, when they embraced professional schools of theology, law, and medicine, and were, to that extent, "universities" in fact, as well as in name. They still have authority to grant professional degrees and do annually grant them. But the principal part of the professional study requisite to the honors they confer is had at London, which is the scientific as well as commercial and governmental center of the kingdom. And yet these schools are not colleges; they are rather clusters of col

leges, or "federations of colleges," each having its own organization, laws, teachers, and pupils, but all under the superior supervision and general control of the university senate, by whose council the general laws are administered, and by whose grace all honors are conferred. The number of the colleges at Oxford is twenty-four; at Cambridge, seventeen. The instruction in the several colleges, each of which is essentially a school of letters, is given by tutors who became such on receiving the degree of bachelor and being elected fellows of the college. But there are also university teachers—thirty-five at Oxford, and about the same number at Cambridge—and these also bear the title of professor. The professional instruction is given by lectures, upon which, however, the pupils of the several colleges, though at liberty to do so, are not bound to attend. And inasmuch as the attendance upon lectures imposes an extra labor upon the pupil, already burdened perhaps by the routine of studies in the college to the limit of his willingness to study, the teaching is practically left to the tutors; but few of whom are teachers by choice, or, in the best sense, teachers at all. The consequence is, that the high rank these two ancient institutions once held has been so far degraded, that even at home they are no longer regarded as universities by the most enlightened and liberal educational men of the kingdom—one of whom but lately, in an official report to the schools inquiry commission, had the frankness, perhaps boldness, to style them mere *hauts lycées*, which, it will be observed, I have felt bound to class with schools of secondary education.

Whether the general overhauling of the institutions of England, political as well as educational, now going on, will result in the reorganization of these schools upon a more philosophic basis, remains to be seen. But of this there can be no doubt, that, at the present, the searcher for schools of letters of a high order, who may go to Oxford and Cambridge for the realization of his desire, will surely come away with a most profound disappointment. I cannot agree with those innovators who would turn them inside out, or upside down, in order to plant schools of science in their stead. For though schools of science are essential to progress in education as well as material development, schools of letters are no less essential; and where better could they flourish than at these grand old seats of the humanities, whose very memories may be made a healthy inspiration to all lovers of letters in England?

FRANCE.

The spirit of France, educationally speaking, is, as before remarked, eminently scientific. It is there that mathematics and the physical and natural sciences find the most congenial soil for their expansion and upward growth. But there, also, the humanities have a place and are cultured with exceeding care. Both are cherished and both honored. In the *Académie de Paris*, at the Sorbonne, the *Faculté des Lettres*, with its distinguished professors of philosophy, of the philosophy

of history, of Greek literature, of Latin eloquence, of Latin poetry, of French eloquence, of French poetry, of foreign literature, of geography, of ancient history, of modern history, and of the languages and literatures of the South, stands side by side, in the most cordial harmony, with the great *Faculté des Sciences*—neither jealous of, but each nobly emulating, the other by the brilliancy and utility of its accomplishment. So, also, in each of the other fifteen academies of the empire, science and letters have a place on the same plane; the total number of chairs in the faculties of letters being eighty-six; in those of science, ninety-seven.

And, there, too, is the *Collége de France*, in which eleven chairs of science have friendly relations with the twenty-one chairs more especially belonging to the domain of letters and philosophy, namely: Of the law of nature and of nations; comparative history of legislation; political economy; history and moral philosophy; epigraphy and Roman antiquities; Egyptian archæology and philology; Hebrew, Chaldaic, and Syrian languages; Arabic language; Turkish language; Persian language and literature; languages and literatures of China and Tartary; Sanscrit language and literature; Greek language and literature; Latin eloquence; Greek and Latin philosophy; French language and literature of the Middle Ages; modern language and literature of France; foreign languages and literatures of modern Europe; Slavic language and literature; and of comparative grammar, together with complementary courses on the history of medicine, and the history of political economy.

Nor is this all: Paris possesses still another remarkable school of letters in the Imperial School of Living Oriental Languages, in which there are chairs of, learned Arabic; vulgar Arabic; Persian language; Turkish language; Armenian language; modern Greek; Hindoostanee; modern Chinese; Malay and Javanese; Algerian Arabic; Thibetian; and Japanese.

No matter what its degree of devotion to the sciences, it can hardly be said of a country, at whose capital are clustered great schools of letters like these—schools in whose numerous chairs are found such men as Chevalier, Laboulaye, Guizot, and a galaxy of others of the most distinguished savans of the age—that it does not still cherish its hereditary love of the humanities.

That letters ought to have a higher development in provincial France is undoubtedly true; but this same is also true of every other department of its education. Independent of its great capital, France is only now awakening to some realization of the contrast the empire at large bears to its dazzling center.

ITALY.

Italy, which, in the character of its higher institutions of learning, is less eminently scientific, but equally or more literary, provides for the high cultivation of letters in like manner, to wit, by means of faculties in the universities. There, however, philosophy is so associated with

letters that separate degrees are conferred upon such students as confine themselves to the one or the other course. The terms of admission are based upon the assumption that no one will present himself to the *Facoltà di Filosofia e Lettere* who is not able to produce his certificate of having completed the course in the lyceum and to undergo an examination upon the Italian and Latin languages and literature, Greek grammar, ancient history and geography, and the elements of philosophy. The term of study in each of the two branches of the faculty is four years; the course in letters being as follows:

First year. Greek literature; Italian literature; Latin literature; ancient and modern geograhpy; ancient history.

Second year. A continuation of the various literatures named, with the addition of modern history.

Third year. Continuation of the studies of the second year, with the addition of anthropology and pedagogy.

Fourth year. Greek, Latin, and Italian literatures, with archæology, comparative study of languages and literatures, and the philosophy of history.

The philosophic course embraces—

First year. Latin literature; ancient history; theoretical philosophy; anthropology and pedagogy.

Second year. Greek literature; theoretical philosophy; history of philosophy; modern history.

Third year. Greek literature; moral and practical philosophy; history of philosophy; theoretical philosophy.

Fourth year. Moral and practical philosophy; history of philosophy; comparative study of languages and literatures; history of philosophy.

The degree conferred in either case is the doctorate; and the student, who having completed one course and received the degree, is also able to pass the requisite examination upon all the branches of study taught in the other course, may also receive the other degree. The great partiality natural to the Italian mind for legal and philosophic studies had long led to the cultivation of letters to a higher degree, than any other department of learning. But with the dawn of science there arose so brilliant a constellation of great discoveries in chemistry, physics, and astronomy, that for a time letters were dimmed in their brightness, and only again appeared in the supremacy upon the reaction that followed the Reformation and gave to the church new power over all the schools of learning. While, therefore, letters and philosophy are cherished in Italy and hold high rank in the great schools of the present, they still wear the impress of a learning distorted, cramped, and doubtingly waiting for the vitalization that is to come with the promised new reign of freedom and independence of thought.

GERMANY.

But Germany is the natural home, and the free home, of letters. Nowhere else in the world do they receive such careful, thorough, and

universal culture; nowhere do they so represent the best there was in the dead past and the all there is of the living present. The great German mind, though slow and steady in its operations, is broad enough and profound enough to take in the whole circle of learning, and so give each, in its development, the advantage of every other department. From the lower class in the gymnasium, upward through that magnificent range of studies presented by the *philosophische Facultät* in all of its universities, completion of which is essential to the doctorate—the only degree conferred—there are a comprehensiveness and a thoroughness that compel the admiration of the lover of true learning whatever his nationality or his prejudices. He may deprecate the tendencies of German philosophy and German theology, but the fire of his enthusiasm is unavoidably kindled by the near contemplation of the patient and masterly manner in which the real German student does his work.

The sciences are found there, having long since been welcomed with open arms, and are also cultivated with equal zeal. But there is no sacrifice of one to the other, and no jealousy between them. Here, as in France, they flourish under the same impartial fostering care. But there are no great separate schools and purely literary faculties of letters in Germany; and hence an account of the German culture of letters would, of necessity, involve an account of its many celebrated universities, notice of which is reserved to a subsequent chapter. Berlin, Halle, Leipsic, Vienna, Munich, Tübingen, Heidelberg, Göttingen, and Bonn—these are the centers of literary influence; and, I may say without disparagement to the rest, Berlin is the center of centers.

It is a great thing for the world that letters have found so secure an abode; as otherwise the bustling, driving business genius of the present age, seeing no good in, and having but little patience with, anything whatsoever that brings not material gain, would be in some danger of extinguishing their light altogether.

SWITZERLAND, RUSSIA, AND OTHER COUNTRIES.

Of Switzerland, compounded of the three national elements already considered, though wearing more of the Germanic than of either the French or the Italian stamp, and possessing more of the stirring, utilitarian spirit of the times than any of them; of Belgium, cast in the French mold; of Holland, so nearly German in its intellectual type, and in the quality of its spirit and culture; of Scandinavia, also largely Germanic in its educational tastes and tendencies; and of Russia, partly European and partly Asiatic, and yet with a positive individuality and a resoluteness of purpose to take on the best form of civilization attainable—of all these I need not specially write in this connection. In each of them there are numerous mixed schools of high literary order; and the last-named has a school of letters—in the university at Kasan—which, in the number of its chairs of Oriental languages, excels all others in Europe.

UNITED STATES.

What have we now in America to group under this head? If we include all incorporated schools of high title, and with power to grant degrees equal to any that can be conferred at Paris or Berlin, we have literally a swarm of "colleges" and "universities," which, if numerically reported at those educational centers in the Old World, where titles have meanings, would compel the conviction that we were the most learned people on the face of the earth. But if we examine more carefully we find that many of these—it would certainly not be unjust to say very nearly all—are not even *hauts lycées*, but a much lower order of institution; some with two professors, others with three or four, and only a comparatively small number with force sufficient to carry through anything like a respectable curriculum of study in the department of letters alone; whereas, under the pressure of practical necessity at the present time, they are each endeavoring to do the full work of both a faculty of letters and a faculty of science at one and the same time. Under such conditions, and with inferior facilities for illustration in the scientific departments, it is not surprising that most of them fail of accomplishing any part of their work thoroughly and well.

Criticism like this will appear to some of my countrymen unjust, especially to such of them as feel it to be hard enough to carry the load they are staggering under, without being reproached that their walk is not upright, steady, and firm. Should a pigmy be ridiculed for not walking off, Atlas-like, with the globe of Heaven on his head? No; but he may be justly enough blamed for voluntarily assuming the burden intended only for a giant. And this is exactly the position of many of our American colleges. Four-fifths of them have been founded more in the supposed interest of some incompetent village or ambitious religious denomination than in the interest of learning. How vastly better to repress that vain pride or ambition for the wiser concentration of means and forces equal to the building up of a few well endowed, equipped, and officered institutions, really worthy of the name so pretentiously worn by over two hundred of our colleges and universities, whose real rank is among the grammar schools. All such institutions—institutions thus originating and thus assuming unwarranted titles—instead of the great blessing they are generally fancied to be, are, in fact, a serious hindrance to the cause of true learning by degrading its standards, and, through foolish expenditures, diminishing the power of the people to endow and sustain schools of a high character.

And yet, after all, there are, here and there, in the New World, precious fountains of pure learning, of which we have a right to be proud. They need and deserve the fostering care of the State governments, and the practical encouragement of all who are lovers of learning, not less for the elevation and refinement it brings than for the mere utilities that may come of its cultivation.

II.—SCHOOLS OF SCIENCE.

Of distinct schools of this class—separate schools, I mean, strictly confined to instruction in general science, and at the same time, by the extent of their courses of instruction and the strength of their professorial force, equal to the work of giving to their pupils a mastery of the several sciences, mathematical, physical, and natural—I know of none in this country. Nor am I aware of the existence of any great school of mixed character, in which the sciences stand foremost, as language, literature, and philosophy stand foremost in the schools of letters.

Some of the leading colleges and universities of America have departments, more or less intimately connected with them, variously known as "scientific course," "scientific department," and "scientific school;" but none of these fulfill the above conditions.

The nearest approach to this type is made by the Sheffield Scientific School of Yale College, New Haven, Connecticut, and the Lawrence Scientific School, connected with Harvard College, (at Cambridge, Massachusetts;) the instruction in which is certainly of the first class, being given by some of the most distinguished scientific men of our times.

SHEFFIELD SCIENTIFIC SCHOOL OF YALE COLLEGE.

I. Its general scope.—The Scientific School of Yale College is a part of the university established in New Haven; its funds are held by the college corporation; its students have access to the general libraries and museums; its graduates are enrolled upon the Yale triennial catalogue; in short, it is one important member of that group of institutions which, in the course of a century and a half, has grown out of the original "Collegiate School of Connecticut."

While thus a part of Yale College, in a broad sense of that term, it is quite distinct from the classical institution commonly called Yale College, and designated on the catalogue as the academic department. Its instructors are appointed by the Yale corporation, but they constitute a body as distinct from the academic faculty as the faculties of law, medicine, and theology. It is this union and this individuality which give the Sheffield School at New Haven the steadiness of an old and well-tried institution, with the freedom of a new foundation. The combination has been in many respects highly advantageous to the new department, and is probably not without some influence for good upon the old and well-known classical department. The establishment of a college of science has relieved the academic or classical college from all pressure tending to the establishment of partial courses of study, and has supplemented its means of instruction by new professorships and new scientific collections; while it has rendered a still greater service by giving to graduates of the department of arts opportunities for special and systematic professional training, distinct from that afforded in the schools of law, medicine, and theology.

On the other hand, the scientific school has had the benefit of the name and repute of Yale College throughout the land. The long-established libraries and cabinets have been opened to the scientific students, who have also attended many courses of the academic lectures. More than all this, many of the officers of the old Yale College, by their influence, encouragement, and counsel, have given to the new college assistance too valuable and enduring to be ever forgotten.

Under these circumstances, it is pleasant to add that, during all the wide-spread controversies between science and letters as means of instruction, the utmost harmony has prevailed among the friends of both in New Haven.

The scientific school is designed to give instruction in the various branches of mathematical, physical, and natural science, with reference alike to the promotion of high intellectual culture, the acquisition of useful knowledge, and the preparation for the various modern professions. While scientific and technical studies are thus made predominant, all candidates for the bachelor's degree are also required to pay attention to linguistic studies, some knowledge of Latin being required for admission, and the study of German, French, and English being continued through the course. In other words, the school aims to make good scholars by modern methods and for modern vocations. It has arrangements for the instruction of three sorts of students: the under-graduate, the post-graduate, and the special; and it is clearly the aim of the instructors to make it a school of science, in the higher acceptation of that phrase, rather than a polytechnic or trade school, in the usual European sense. The requirements for admission are high, the examinations thorough, and consequently the graduates are, as a general rule, superior young men, eagerly sought for in responsible positions.

II. Its history, endowment, and organization.—The Sheffield Scientific School of Yale College was begun in in 1846, and is so organized, as we have stated, to give advanced instruction in various branches of physical, natural, and mathematical science, and, to some extent, in linguistic and historical studies.

It bears the name of its chief benefactor, Mr. Joseph E. Sheffield, of New Haven, who has given to it, since 1860, a building twice enlarged and improved at his own expense, apparatus, and models, a library fund, and an instruction fund of over fifty thousand dollars. The school is also the recipient of the Connecticut portion of the congressional appropriation for the encouragement of scientific education, and as such has been recognized by the State as the "College of Agriculture and the Mechanic Arts" for Connecticut.

The fund which was received from this last-named source in 1864 amounts to $135,000, safely invested in six per cent. securities. From other sources the school has received generous benefactions, and a movement is now in progress to secure for it a permanent and ample endowment.

The trustees of its funds are the president and fellows of Yale College, by whom all appointments are made; the interests of the State are protected by a board of visitors, including some of the chief officials of the State; an advisory body of councilors, composed of men from different parts of the country, has been recently appointed; and under the supervision and co-operation of these three bodies, the chief administrative duties belong to the permanent professors of the school, who are called the "Governing Board."

III. THE TEACHERS AND THEIR TOPICS.—There are ten professors who give instruction to the classes of the Sheffield School of Science, not including those professors connected with other departments of Yale College, who are freely accessible to students in science who wish to consult them. There are are also nine other instructors, and a government professor of military science, employed during the whole or part of their time, making in all a corps of twenty teachers.

The work of these instructors may be grouped in four departments: engineering, chemistry, natural history, &c., language, &c., each including as follows:

1. *Engineering, &c.*—Mathematics; civil engineering; mechanical engineering; elementary physics; astronomy, theoretical and practical; analytical and descriptive geometry; land surveying; drawing, mathematical and free-hand.

2. *Chemistry, &c.*—Analytical chemistry, metallurgy and assaying, elementary chemistry, agricultural chemistry, agriculture, laboratory practice.

3. *Natural History, &c.*—Mineralogy, botany, zoology, palæontology, geology, physical geography.

4. *Language, &c.*—German, French, English literature, elocution, linguistics, modern history.

In addition, military science is taught by the professor appointed by the United States.

IV. BUILDING AND EQUIPMENT.—The building occupied by the school was the gift of Mr. Joseph E. Sheffield, of New Haven, and is known as "Sheffield Hall." It is a large and commodious structure, which includes a variety of recitation and lecture rooms, laboratories, museums and cabinets, an astronomical observatory, &c., and is adapted to the instruction of about two hundred students.

The following is a summary statement of the collections belonging to the school:

1. Laboratories and apparatus in chemistry, metallurgy, mechanics, photography, and zoology.

2. Metallurgical museum of ores, furnace products, &c.

3. Agricultural museum of soils, fertilizers, useful and injurious insects, &c.

4. Collections in zoology.

5. Astronomical observatory, with an equatorial telescope by Clark and Son, of Cambridge, a meridian circle, &c.

6. Library and reading room, containing books of reference, and a selection of German, French, English, and American scientific journals.

7. Models in architecture and civil engineering.

8. Philosophical and mechanical apparatus, much of it purchased in Europe during the year 1869.

9. A collection of maps, charts, and reliefs, to illustrate geographical science.

The mineralogical cabinet of Professor Brush, the herbariums of Professors Eaton and Brewer, the collection of native birds of Professor Whitney, the astronomical instruments of Professor Lyman, and several good private libraries are also at the service of the students.

V. Students and courses of studies.—The students are of three classes: first, those who are pursuing a three years' course with reference to the degree of bachelor of philosophy; second, those who have already taken a bachelor's degree, and are pursuing higher special studies; third, those who have no thought of a degree and are admitted to particular lectures and exercises corresponding to their requirements. The first of these classes is the largest, the second is steadily increasing, and the third is diminishing.

There are now (1870) enrolled one hundred and forty-one students, of whom twenty-eight are graduates, one hundred and one are candidates, and twelve are pursuing partial courses. They come from twenty-two different States. The tuition charges are one hundred and fifty dollars per year.

For the advanced and special students, courses of study are arranged from time to time according to their requirements. All others are obliged to pass the entrance examination, which includes algebra, geometry, and trigonometry, Latin, (sufficient to read a classical author,) and the usual branches of a good English education. During the first year, the curriculum includes analytical and descriptive geometry, surveying and drawing, physics, chemistry and botany, German and English. At its close each student elects one of seven special courses which he will follow. These courses are:

1. Chemistry and mineralogy; 2. Civil engineering; 3. Mechanics; 4. Mining and metallurgy; 5. Agriculture; 6. Natural history and geology; 7. Select course of science and literature.

Each of them has a prescribed succession of studies, largely, but not wholly, professional, and extending through two years more. The particulars of these courses can be learned in the annual catalogues.

VI. Modern professions for which instruction is provided.—While the catalogue announces seven chief "sections" of the school, the present arrangements for instruction have reference to the requirements of a still more varied company of students. There are three marked subdivisions of the branches of technical instruction, as here provided,

namely: 1. Chemistry and physics; 2. Mathematics and engineering; 3. Natural history.

There is also provisions for the study of modern languages, geography, history, and political economy, to which the students are required to give more or less attention. In each of the groups above mentioned there is great freedom of choice respecting the general direction which a student may take; but, when his decision is made, there is a definite and prescribed curriculum to which he is restricted. In the combinations of the different classes, students are received who desire to qualify themselves for such professions and occupations as the following:

1. Men of science—either as professors, teachers, explorers, investigators, amateurs, &c.

2. Chemists—with reference to agriculture, manufactures, and many commercial pursuits.

3. Metallurgists and assayers.

4. Civil engineers—with reference to the construction of roads and bridges, aqueducts, reservoirs, drainage systems, and public works in general.

5. Mechanical engineers—with reference to the superintendence of manufactories, the invention and construction of machinery, the application of steam, &c.

6. Mining engineers—with reference to the development of mineral wealth, the superintendence of mines, &c.

7. Agriculturists—acquainted with the constitution of the soil, the laws of animal and vegetable life, the experience of other nations, &c.

8. Naturalists—either in the direction of zoology, botany, mineralogy, or geology.

9. Physicians and sanitary advisers—not as pursuing here medical and surgical studies, (which must be afterward taken up in the medical schools,) but in preparation for the latter by studies in physics, chemistry, botany, comparative anatomy, &c.

10. Manufacturers and superintendents of manufactories.

11. Besides all these specialists, students are received who desire, by a course of training chiefly mathematical and scientific, but likewise including linguistic and historical studies, to prepare themselves for higher studies in science, or for business, or for other professions not specified above. This course has been here selected by young men designing to become clergymen, lawyers, editors, teachers, &c.

LAWRENCE SCIENTIFIC SCHOOL.

The courses of instruction in the Lawrence Scientific School, connected with Harvard College, Cambridge, Massachusetts, embrace: chemistry, zoology and geology, engineering, botany, comparative anatomy, mathematics, and mineralogy.

"Candidates for admisssion must have attained the age of eighteen years, have received a good common English education, and be qualified

to pursue to advantage the courses of study to which they propose to give their attention."

The course in chemistry includes instruction in theoretical and experimental chemistry, and systematic and quantitative analysis, together with a solution of problems of research in experimental science, and in the applications of science to the arts.

The instruction in the department of zoology and geology consists of courses of lectures on zoology, embracing the fundamental principles of the classification of animals, as founded upon structure and embryonic development, and illustrating their natural affinities, habits, geographical distribution, and the relations that exist between the living and extinct races; and of courses on geology, both theoretical and practical, with occasional laboratory lessons in the methods of studying nature.

The mathematical course embraces instruction in the higher mathematics, especially in analytical and celestial mechanics.

Botany is taught by practical lessons in both the structural and systematic divisions of that science.

Comparative anatomy is taught by lectures and by special lessons in the anatomical laboratory.

The course in mineralogy embraces theoretical crystallography, the determination and drawing of crystals, the study of the physical properties of minerals, and the determination of mineral species, and consists of lectures and practical exercises in the laboratory.

Through the munificent endowments granted by several noble patrons of science in Massachusetts, as well as by means of the practical services rendered by the distinguished professors—Agassiz, Wyman, Gray, and others—the Lawrence Scientific School is already provided with museums and laboratories of much value, and the opening future gives promise of yet more rapid development and of still greater usefulness. What it greatly lacks, at present, is an increase of endowment to enable it to add to its working force and to diminish the cost of instruction.

Standing very nearly on the same basis with these schools are the Chandler Scientific School, connected with Brown University, (at Providence, Rhode Island;) the scientific courses in the Universitiy of Michigan, (at Ann Arbor, Michigan,) and the scientific courses and departments in several other prominent institutions of the country. There is a growing tendency to meet the demands of the times by the creation of such departments in all the colleges and other literary schools of the United States.

FACULTIES OF PHILOSOPHY IN EUROPEAN UNIVERSITIES.

In like manner more or less of science is taught in what are known as the *faculties* of *philosophy* belonging to the universities of most European states—in some of them much more extensive and thorough individual courses being given than in our own country. But, so far as I have observed, the only close parallels to the American scientific schools,

above referred to, are presented by the leading universities of Belgium, Holland, Denmark, and Italy, and by the sixteen academies of France.

FRANCE.

In the French *Faculté des Sciences* the amount of instruction given varies somewhat with the locality of the academy to which the particular faculty belongs; though in the case of all, except the faculty belonging to the Academy of Paris, there are about the following professorships, to wit: of pure mathematics, of mathematics applied, of physics, of mineralogy and geology, of botany, of zoology and physiology, and of chemistry. In some cases the branches here indicated as being united under one professorship are assigned to two professors, and in others some of those separately named are united as one.

There being demand at Paris for a more extensive course, the number of branches taught and of professors is much greater—sufficiently so to constitute it the highest and most complete faculty of science in the world; while the corps of professors includes many of the most distinguished names known to the science of the present age.

The professorships in this institution—*Faculté des Sciences, à la Sorbonne*—are as follows: physical astronomy, mathematical astronomy, superior algebra, superior geometry, differential and integral calculus, calculus of probabilities and mathematical physics, (two professors, assisted,) physics, (two professors,) rational mechanics, physical mechanics, (two professors,) chemistry, (three professors,) mineralogy, geology, botany, general physiology, zoology, anatomy and physiology, anatomy, comparative physiology and zoology.

Besides the regular professors, upon whom the responsibility rests of giving the above courses of instruction, there are honorary professors and private lecturers, who further add to the instructional force.

The diplomas accorded to students who have completed the various courses of scientific study in the academy are of four general grades: for the diploma of bachelor of sciences (*bachelier ès sciences complet*) the candidate must be at least sixteen years of age, and satisfactorily pass both a written and an oral examination. The written proof of fitness consists (first) of a thesis upon a mathematical subject and a physical subject; and (second) of a Latin translation, if the candidate does not present the diploma of bachelor of letters. If both of these ordeals are passed to the satisfaction of the examiners, the candidate is then admitted to the oral examinations; which bear upon the elementary mathematics taught in the second year of the lyceum course, and upon the mathematical, physical, and chemical sciences. Candidates not possessing the diploma of *bachelier ès lettres* are also examined in some living language as well as upon geography, history, and philosophy. The diploma fee is one hundred francs.

The diploma of bachelor of sciences, limited, (*restreint*,) is designed for medical students, as the lowest degree with which they can be admitted

to an examination in medicine for the doctorate, and differs in no respect, except that the amount of knowledge of mathematical science demanded is less than in the other case.

The diploma of licentiate (*de licencié ès sciences*) is next in rank above that of bachelor. In order to be admitted to an examination for this degree, the applicant must produce the diploma of bachelor of science, obtained within one year, and (unless prevented by the performance of functions in some department of public instruction, in which case this rule may be waived) must have taken at least four courses prescribed in the faculty.

The licenses are of three kinds—for the mathematical sciences, for physical science, and for the natural sciences—and the diplomas accord with the department of science, in which an examination is passed by the candidate.

The examinations in all cases are, first, written; second, practical; and third, oral; and the candidate is only admitted to the second and third after having satisfactorily passed the preceding trials. The practical examinations take place in one of the cabinets or one of the laboratories of the faculties. The fees, all told, are 140 francs.

The diploma of doctor of science is also divisible, so to speak, into three degrees, namely, that of doctor of the mathematical sciences, doctor of physical science, and doctor of natural science. In order to obtain either of these degrees—and the candidate may obtain them all in one, if possessed of the requisite qualifications—it is necessary to be provided with the diploma of licentiate, and to submit and defend two theses to the approval of the examiners. The fees in this case are 140 francs.

But this faculty of science is by no means the only great school of science of which the capital of the French empire may boast. There are at least two others hardly less remarkable, either for the number and extent of their courses of scientific study or the learning and world-wide distinction of their professors.

The *Musée d'Histoire Naturelle* is one of these two. Located in the *Jardin des Plantes*, where its great museum collections, and its many laboratories, amphitheaters, and auditoriums are surrounded by magnificent botanical gardens, conservatories, and important collections of living animals, it dwells in the very atmosphere of science, and possesses attractions almost strong enough to draw even the worldling from his unsatisfying pursuits and compel him to the enthusiastic study of nature.

Directed jointly by those distinguished savans MM. Chevreul and Milne-Edwards, it has gathered to its chairs of instruction some of the most celebrated naturalists of the empire, and is now, as it long has been, the leading natural history school of Europe.

The following are the titles of distinct administrative professorships: comparative physiology; comparative anatomy; the anatomy and natural history of man; zoology—mammals and birds; zoology—reptiles and fishes; zoology—insects, the crustacea and arachnida; zoology—anne-

lides, mollusks, and zoophytes; botany and vegetable physiology; geology; mineralogy; paleontology; physics applied to natural history; vegetable physics; chemistry applied to organic bodies; chemistry applied to inorganic bodies.

The other institution to which allusion is made above, as furnishing instruction in science of a high character, and to a liberal extent, is the *Collége Impérial de France*. This great institution has already been noticed in the chapter on schools of letters, to which class it rather more properly belongs; but it is also proper to mention it here, since, in addition to its twenty-one chairs of a literary character, it also includes the following eleven chairs maintained purely in the interest of science, to wit: *Mécanique céleste*, mathematics, general and mathematical physics, (two professors,) general and experimental physics, (two professors,) chemistry, organic chemistry, natural history of inorganic bodies, (two professors,) and comparative embryology.

Grouping together these several purely scientific schools and portions of mixed schools, including numerous scientific chairs, and adding to them the other scientific institutions of Paris, such as the Imperial School of Charts; the Imperial Observatory, with its astronomers, headed by the illustrious M. Le Verrier, and their ten adjuncts and aids; the Bureau of Longitudes, and, crowning all, the great Academy of Sciences, as their guide and inspiration, and we have a brilliant cluster of scientific schools and agencies such as is presented by no other city or country in the world.

ITALY.

In Italy a faculty of mathematical, physical, and natural science (*facoltà di scienze fisiche, mathematiche e naturali*) is found in nearly all the royal, and in three of the free, universities. All such as are connected with the royal universities are subjected by royal decree to the following general regulations, to wit:

The candidate for admission as a student must (first) prove that he has passed the examination required for a licentiate in some government lyceum, or in the physical and mathematical section of one of the technical institutes of the kingdom; and (second) pass an examination before the board of the faculty, bearing upon the Italian and Latin languages and literatures, geometry, trigonometry, and algebra.

The diplomas attainable at the end of the four years' course of study are of four kinds, viz: the diploma in pure mathematics, the diploma in physico-mathematical science, the diploma in physico-chemical science, and the diploma in natural history. The degree in each case is that of doctor.

The studies prescribed, the mastery of which is a prerequisite to graduation, are—

For the diploma in the department of *pure mathematics:*

First year. Algebra, complementary; analytical geometry; inorganic chemistry; design.

Second year. Differential and integral calculus; descriptive geometry; design.

Third year. Rational mechanics; theoretical geodesy; physics; design.

Fourth year. Analytical and higher geometry; physical mathematics; astronomy, and *mécanique céleste.*

For the diploma in the department of *physico-mathematical science:*

First year. Algebra, complementary; physics; inorganic chemistry; exercises in physics.

Second year. Differential and integral calculus; physics; organic chemistry; exercises in chemistry.

Third year. Rational mechanics; analysis and higher geometry; mineralogy and geology; exercises in practical physics.

Fourth year. Astronomy and *mécanique céleste;* mathematical physics; practical exercises in physics; practical exercises in astronomy and geodesy.

For the diploma in *physico-chemical science:*

First year. Physics; analytical geometry; botany; exercises in physics.

Second year. Inorganic chemistry; physics; mineralogy and geology; exercises in chemistry and in crystallography.

Third year. Organic chemistry; zoology; comparative anatomy; physiology; exercises in chemistry.

Fourth year. Inorganic chemistry; organic chemistry; exercises in chemistry.

For the diploma in *natural history:*

First year. Physics; inorganic chemistry; human anatomy; practical exercises in chemistry.

Second year. Physics; organic chemistry; mineralogy and geology; practical exercises in mineralogy and geology.

Third year. Physiology; botany; zoology; comparative anatomy; practical exercises in botany.

Fourth year. Botany; zoology; comparative anatomy; mineralogy and geology; practical exercises in zoology and comparative anatomy; geological and botanical excursions.

It is forbidden to take, at the same time, the studies that lead to two diplomas; but a graduate from one of the three last-named scientific courses is allowed, at the end of two years in either of the other two of the three, to present himself for examination as a candidate for the diploma in that course. And, in every one of the four courses, the student who satisfactorily passes the examinations at the end of the first and second years receives the degree of bachelor. So, likewise, one may receive the title of licentiate at the end of the third year, if all the several examinations have been satisfactorily passed.

The price of tuition in any of the scientific courses above mentioned for the entire term of four years is 240 lire, (less than $40;) for each of the four years, 60 lire.

Each of these faculties or schools in the universities has its own college or board of regents, with its president and secretary; and each of the four divisions is presided over by an executive, known as president.

The number of professors varies, of course, for different locations, but in no case have I found less than seventeen regular professors; and in some cases, as at Milan, Turin, Genoa, Naples, Florence, Bologna, for example, the number is from twenty-five to thirty-five, besides numerous honorary, emeritus, and independent professors, who give lectures bearing upon the subjects taught.

It is hardly necessary to add that these schools are well provided with the means of illustration; the fact of their connection with some of the oldest and best furnished universities in Europe being sufficient guarantee on this point. In some instances, no less a number than twenty distinct and immense collections, laboratories, libraries, observatories, &c., being all at their service.

DENMARK, HOLLAND, AND BELGIUM.

In the Danish University, at Copenhagen, there is a faculty of mathematical and natural science, (independent of the polytechnic school, of which some account is given under its appropriate head,) in which the instruction is exclusively scientific, embracing courses in the following branches, to wit: mineralogy and geology, special geology of Denmark, general and analytical chemistry, zoology, general physics, chemical physics, astronomy and the history of astronomy, higher mathematics, general botany, with special botany of Denmark, and botanical excursions.

The instruction is by eight professors, with the aid of all the material facilities afforded by the university.

Holland also presents the same feature in her leading institutions of learning. For although the faculty of the sciences in the Dutch universities, as, for instance, in the old University of Leyden, bears the title of "faculty of mathematics and physics," there are really given in this school very thorough and amply illustrated courses of instruction in zoology and anatomy, including comparative anatomy, general chemistry, chemistry in its practical relations, geology, morphology, physiology, botany, &c., in addition to the usual courses in the higher pure and applied mathematics. The terms of admission are the same and the honors of graduation equal to those for the other faculties.

In Belgium the departments of science bear the same title as in France, (*faculté des sciences*,) and the branches of study are very nearly the same. The division of the sciences into courses is two-fold, instead of four-fold, as in Italy, viz: into the course in the natural sciences, and the physical and mathematical sciences. The honors conferred in both of these divisions are of two grades—the title of candidate and the title of doctor. The first is conferred in the natural science division, after a successful examination in elements of chemistry, inorganic and organic,

experimental physics, elements of botany and the physiology of plants, zoology, mineralogy, psychology.

The examination requisite to the title of candidate in the physical and mathematical sciences is in higher algebra; analytical geometry complete, descriptive geometry, differential and integral calculus, as far as and including quadratures, experimental physics, elementary statics, mineralogy, psychology.

The title of doctor in the division of natural sciences is conferred upon such as have already received the honors of candidate, after a searching and satisfactory examination in chemistry, inorganic and organic, comparative anatomy, comparative physiology, vegetable anatomy and physiology, geography of plants and natural families of plants, mineralogy, geology, physical astronomy.

The branches in which a candidate must be examined for the degree of doctor in the physical and mathematical sciences are, analysis, analytical mechanics, mathematical physics, astronomy, and calculation of probabilities.

AUSTRIA, PRUSSIA, AND OTHER GERMAN STATES.

Austria, Prussia, and the other German states, supply numerous important courses of scientific instruction in the philosophical faculties of all their great universities; and the same is true, to a less extent, of all the other continental countries, but none of them either possess distinct and independent schools of science, or university faculties of science, or furnish other scientific instruction than is given by individual professors in the faculties of philosophy, and in their real, technical, and polytechnic schools. But there the aggregate amount of scientific instruction thus furnished is very great, and is constantly increasing by means of the great number of the institutions just named that are annually founded, and by reason of the growing tendency of the philosophical faculties to strengthen themselves on the scientific side. Indeed, it is hardly over-stating the case to say, that the spirit of science is fast becoming rife everywhere on the continent, and seems destined soon to become the dominant spirit in all parts of the Old World.

GREAT BRITAIN.

Great Britain has long been an exception to this enthusiasm for science; the Royal School of Mines, at London; the Royal College of Science, at Dublin, and a few scattering chairs of chemistry and natural history in the universities and some of the other high-schools, having long presented the sum total of what the English nation was doing in the way of diffusing a knowledge of science in the United Kingdom. But, at last, this slowest of the nations to follow the lead of even its own pioneers in the way of progress, has been aroused to an apprehension of the necessity that exists for doing something in this direction, as the alternative of an early and final loss of its supremacy in every branch

of industry to which the sciences are more especially applicable; and, through the agency of its new Science and Art Department of the Committee of Council on Education, gives promise of a revolution in its educational affairs.

It is true that this movement is, at present, pretty much confined to elementary teachings in the lower schools of the principal towns and cities, and has been initiated with a direct view to the applications of industry; but it is no less certain that the bits of leaven thus distributed over the kingdom will soon have their influence upon the whole mass of the people, and thus, at a very early day, effect important reformations in all the higher institutions.

The plan adopted by the Science and Art Department is to induce the opening of classes for science in as many of the schools as possible, by offers of so much government pay for a given amount of scientific instruction in schools of both elementary and secondary grade, and to encourage the ambition of pupils by the offer of a definite number of royal prizes in the form of medals, entitling those who receive them to free scholarships, tenable for from one to three years, in the higher scientific schools at London and Dublin. From the minutes of the department I gather the following more definite and highly interesting information on this subject.

Besides the provision for a large amount of technical and professional instruction—with which I am not now dealing—aid is given to instruction in plane and solid geometry, elementary and higher mathematics, theoretical mechanics, acoustics, light and heat, magnetism and electricity, inorganic chemistry, organic chemistry, geology, mineralogy, animal physiology, zoology, vegetable physiology and botany, and in systematic botany.

In order to place any school or class in the way of receiving aid, it is necessary that a committee, consisting of at least five persons, should undertake to perform the requisite duties of superintendence.

The aid consists of, first, payments to certificated teachers on the results of instruction as tested by examinations held simultaneously throughout the kingdom; second, of medals and prizes to the successful students; third, of grants to the school in aid of the purchase of apparatus; and, fourth, of royal "exhibitions" and free admissions to the Royal School of Mines, in London, and the Royal College of Science, in Dublin.

The payments to the teachers vary from £1 to £5, according to the class in which the student is placed. There are five classes, the fifth being the lowest. The payments are only made for the instruction of students of the artisan or weekly wages class, and those whose incomes are less than £100 per annum. The teacher, to be qualified to earn payment on results, must have taken a first or second class certificate, or be possessed of a university degree; though it is not necessary to enable a class to be examined and obtain prizes that the teacher should be certi-

ficated, as under the supervision of a satisfactory committee any class or single student can be examined, however taught.

Prizes which, with some few restrictions, are open to all students, are given to such as obtain a first, second, or third class award. To the best in each subject are given a gold, a silver, and two bronze medals. All who receive gold medals are granted free admission at either of the royal institutions above named. Besides these prizes there are given in competition at the annual examinations (which are held in May) six royal "exhibitions" of the value of £50 each—three insuring admission to the Royal School of Mines, and three to the Royal College of Science.

In addition to the foregoing, for the higher grade of schools, the minute of December, 1867, provides for two forms of scholarship in connection with elementary schools, whether receiving state aid as such or not. The first is known as the "elementary school scholarship;" the amount being £5 granted to the managers of any elementary school for the support of a deserving pupil, if they undertake to support him for a year and subscribe £5 for that purpose. The second, a more advanced scholarship, and known as the "science and art scholarship," amounts to £10, and is granted in aid of the support, for one year, of such deserving pupils as at the annual examinations shall have won at least a third-class award. In both of these cases the student must be from twelve to sixteen years of age; the number of "exhibitions" dispensed by the department is not to be greater than one for every one hundred students in any given school, and the selection must be by competition. Lastly, this same minute provides for local "exhibitions" in aid of students of advanced scientific attainments, who may desire to complete their scientific education at some higher school. The amount to be granted is £25 per annum for one, two, or three years, on the conditions that the locality shall raise a like amount by voluntary subscription; that the "exhibition" shall be awarded in competition, (the branches for which may be determined by the locality,) and that the student shall pursue his studies satisfactorily. Should the student thus aided select as the place of his higher studies either of the scientific institutions above mentioned, it is further resolved that all fees shall be remitted.

In evidence of the interest and activity awakened by this general movement of the science department, it may be stated that the number of "science schools" has increased from 9, in 1860, to 300, in 1868; and the number of pupils in annual attendance, from 500, in 1860, to 15,010, at the close of 1868.[1] The number of localities in which the schools had been established, up to the latest date mentioned, was 261. These are noble results, at once reflecting credit upon the wise and liberal action

[1] The latest returns, March, 1869, show that the number of science schools had increased to 514; of these, 354 were in England, 28 in Scotland, and 132 in Ireland. In these schools there were 1,448 classes, in which about 21,000 students were receiving instruction. These returns are irrespective of navigation schools, which do not send up pupils for examination, and therefore receive no payments on results.

of the department, and awakening great hopes for the future of scientific education in Great Britain.

The impulse lately received by science, in both the Old and the New World, is such that nothing can now effectually hinder its progress. The great question of the present, therefore, is how to give to the movement the most judicious aid and direction, so as to make it yield the largest possible results as the pioneer of mankind in rising to a higher civilization. There must be no jealousy on the part of the world of letters. The highest civilization cannot be without the culture that comes of a knowledge of language, literature, and philosophy. But while we strive directly to extend the advantages which the study of these is now only able at the best to bring to the few, let us bid an intelligent and hearty God-speed to this growing giant of science, whose mission it is to conquer the material forces, and thus provide a broad and substantial foundation upon which a vastly larger number than at present may enjoy that complete culture essential to the highest individual and social condition of man.

III.—SCHOOLS OF ART.

ART SCHOOLS REPRESENTED AT THE EXPOSITION.

The latest advances in the progress of art education were illustrated at the Exposition of 1867 by the most remarkable collection of works of art, as the product of school labor from school instruction, ever made; and this, let it be distinctly understood, at an industrial exhibition where industries, new and old, were the main exhibits. If the stern, physical necessities that press around man's life of toil found illustration in almost countless forms of ingenuity and handicraft, the possible amelioration of these severities was set forth by only less numerous displays in that wide range of art from which the poorest might select something befitting his means. The artistic exhibits of this class were not the outgrowth of genius, supposed to have power to work its way unaided, but of the instruction that had developed and directed such genius and talent as are the more common gifts of nature.

The countries represented by these works were France, Italy, Germany, Austria, Russia, Spain, Switzerland, England, and Brazil. The schools represented were mostly municipal establishments, and among the noted ones those of Paris, Nuremberg, Munich, Venice, Vienna, St. Petersburg, Barcelona, and London. Instruction in schools of this class is very generally gratuitous, and open to applicants from all classes showing an aptitude for it.

Of those art schools that rise above the municipal, several of the above-named countries have one central institution which is of state or royal patronage, and devoted to the higher education of such as give promise of becoming masters of the practice or teaching of art.

Of these, the "École des Beaux-arts," of Paris, is a leading one. It

is under the direction of the minister of the house of the Emperor and of the fine arts, and has for its object instructions in painting, sculpture, architecture, and engraving on metals and on precious stones. A high degree of proficiency in all that is preparatory to these studies—as in drawing, designing, modeling, &c.—and a fluent use of the French language, are required for admission to either the general or special instruction, which, to the limit of accommodations, is furnished in the ateliers of the several professors. The ages of admission range from fifteen to twenty-five; instruction is gratuitous; and foreign pupils are admitted on the special permit of the minister.

We are so accustomed to think that such things are to be expected of old and aristocratic governments, and that the rest of the world may as well go to them for such privileges as they offer, that it may be profitable to turn from this pride of the Old to a rising city of the New World.

ACADEMY OF THE FINE ARTS, BRAZIL.

At Rio Janeiro, Brazil, there is an "academy of the fine arts," with a course of instruction divided into sections as follows:

The first section comprises classes in geometric design, ornamental design, and civil architecture.

The second section, classes in ornamental sculpture, engraving of medals and of precious stones, and statuary.

The third section, classes in sketching of figures, landscapes, flowers and animals, historical painting, and living models.

The fourth section, the chairs of application of mathematical principles, anatomy and physiology of the passions, history of the fine arts, æsthetics, and archæology.

The fifth section is formed by the conservatory of music.

Neither the effective (working professors) nor the honorary ones, the first appointed by the government and the last by the academic body, can accept the positions without presenting to the academy one of their works, which thereafter remains the property of the institution. From this it will be seen that the professors must have experience and skill in art. An honorary professor may be called upon to fill the temporary vacancy of a working one, if deemed essential to the interest of the institution by the general director.

In 1866 the several sections of this academy numbered 216 students, 48 of whom obtained prizes at the annual exhibition, at which there must be displayed the entire work of all the pupils for the year. Every two years there is a general exhibition of the works, for that time, of the academy and of the private studios of artists throughout the provinces, at which both native and foreign artists may compete. At these exhibits there is a prize extraordinary for the most eminent Brazilian pupil, which prize consists in pensioning the artist to the extent of six years' study in Europe, if a historical painter, sculptor, or architect; and for a four years' study, if an engraver or landscape painter.

Instruction in all the departments is gratuitous, the conservatory of music having a special director, edifice, regulations, &c.; and the entire expense to the government being near $26,000 per annum.

This, as an example of what may be done for national art at a great distance from art centers, is certainly very creditable.

ART EDUCATION IN MUNICH.

From the facilities there found in other departments of superior education, the presence of great masters, and rare collections for each, it is at Munich that art education is most widely sought, there being at this point scarcely less than one thousand students at any time. The Royal Academy of the Fine Arts, which was founded in the first years of the present century, and which has had an uninterrupted life of prosperity since its new constitution and endowment by the noble Louis, in 1846, is both a society of artists and a school of art.

Instruction in this school includes historical painting, sculpture, architecture, engraving, the history of art, anatomy, perspective, descriptive geometry, and shading. While the antiques are much favored as studies for drawing, great attention is given to models from nature. Instruction in historical painting is given in four distinct schools, each having its professor, as have the separate schools of sculpture, architecture, and engraving. There are regular lectures upon the history of ancient and modern art, on anatomy, and all branches of related knowledge, by men eminent in these departments.

The full course requires six years, though pupils attaining the required proficiency may leave at earlier periods; no one being admitted who has not previously acquired great facility in drawing and a fair scholastic education, and then on a probation of six months before installation as pupil of the academy. Instruction is gratuitous to both natives and foreigners upon the same terms of qualification.

ART SCHOOLS IN FRANCE.

Between the international exhibitions held at London, 1851, and at Paris, 1855, an inquiry was instituted in France, through a commission of distinguished gentlemen, as to the means of promoting the artistic industrial resources of the common people. The report of M. Ravaisson to the minister of public instruction referred this great interest directly to their system of popular education, and set forth, in most convincing terms, the essentiality of drawing as an element of the most indispensable value in early training. He took the ground, moreover, that drawing should be taught as the basis of pure art, leaving it free to develop into the industrial or the fine arts, as circumstances and taste directed. To this end he urged that the models from which the very beginner commences to copy should be those that are perfect of their kind, but simple in their parts—as the head in such detail as would insure the greatest success in later combination of the whole. This

report is full of suggestions as to the feasibility of advancing all forms of industry by the same elementary instructions that prepare for the highest art, and for introducing it to the reach of all who care for such education. At that time the public treasury was supporting a higher grade of art-education at an annual expense of between $400,000 and $500,000; and though the report referred to was made by decree of the minister of education the basis of such additions as it recommended to the scheme of public instruction, it is not until some years later that there are reliable statistics of its adoption in the communal or most primary schools.

Between 1865 and 1867, 180 of these schools, in the department of the Seine and city of Paris, were instructing classes of mere children in the elements of drawing and design, with all the facilities that several previous years of preparation had secured. In 1863 a municipal appropriation of 30,000 francs had been made for this preparation, which consisted in opening competitive examinations for qualified instructors, who should be ranked as professors, and be, for what they undertook to teach, masters and mistresses indeed. The carefulness of scrutiny to which the aspirant for this new place in the public school was subjected may be inferred from the statement that, out of 179 candidates, but 27 were accepted as qualified to instruct in ornamental, and 13 in geometric design. In addition to the teachers provided at such pains and delay, the commission in charge of this enterprise had procured an overhauling of all such models as had been in use in schools of design, throwing out, at the decision of the most severe criticism, all such as were not of superior value, remodeling and assorting and adding to, until, between the dates mentioned when instruction actually commenced in these schools, 35,000 models, embracing busts, engravings, photographs, bas-reliefs, and sketches, selected from the entire range of Greek, Roman, and modern art, had been distributed. These models, &c., had been classified so that they would, in turn, pass the circuit of all the schools, as of the evening classes opened in connection with these daily instructions for the benefit of such adults as sought their advantage.

The result of this movement that is intended to extend to the communal schools of the empire as fast as it can be done without lowering its standard, as of the frequent inspection of the mode of instruction and the work done by pupils, has been declared more than satisfactory. Material proof of this is found in the fact that, whereas in 1863 the municipal appropriation of 30,000 francs was deemed sufficient to inaugurate the measure, the appropriation of but two years after its first test, that of 1867, was 312,000 francs to enlarge and carry it to still further successes.

Art properly taught has not only an educational value for itself, but it is a valuable accessory to school discipline, relieving the monotony of the routine of ordinary school studies. The absence of art instruction in common schools is a serious defect. The addition of such instruction

would be most salutary, and tend to repress the increasing restlessness of our population.

It may be justifiable to console ourselves, on behalf of our country and of the world, by the reflection that the art education has been longest delayed, because it has been supposed to touch only that social development of a people last reached; and because, old as is the oldest country in comparative history, all are yet new in the work of understanding the complete needs of man.

SPECIAL EDUCATION.

CHAPTER VI.

INDUSTRIAL SCHOOLS.

SCHOOLS OF THE ARTS AND TRADES—RUSSIAN SCHOOL—FRENCH SCHOOLS, AND THE COURSES OF STUDY—GERMANY—SCHOOLS IN OTHER COUNTRIES OF EUROPE—ASSOCIATION PHILOTECHNIQUE OF PARIS—MECHANICS' ASSOCIATIONS IN THE UNITED STATES—SCHOOLS OF APPLIED ART IN EUROPE—RAPID INCREASE IN GREAT BRITAIN—SCIENCE AND ART DEPARTMENT—SOUTH KENSINGTON MUSEUM—WURTEMBERG—NECESSITY FOR TEACHING THE PRACTICAL APPLICATIONS OF ART IN THE UNITED STATES.

It was natural that the important scientific discoveries which rapidly followed the introduction of the Baconian philosophy should have given origin to a class of schools specially designed to furnish instruction in the mathematical, physical, and natural sciences, whose potency for the advancement of the arts of civilization soon became unquestionable. Speculative philosophy, dogmatically asserting itself and promising grand results that never came, began, so soon as the foundations of science were laid, to lose its hold upon the best minds of the age; and not a few of the most culture came to see that scholasticism was not of itself sufficient to meet the practical needs of mankind, and seriously to question whether it was best to require every ambitious lover of knowledge to follow in the old beaten path, regardless of his purposes or his necessities.

One of the early fruits of the new philosophy was the establishment of the real schools as divergents of the gymnasia, some account of which has been given, Chapter IV. But the real schools were rather designed to fit a certain class of youth, presumed to be wanting either in ability or in inclination to pursue the classics, for the ordinary general duties and business of life. The idea that the engineer, the miner, the mechanic, and the farmer required, for the most successful practice of their several occupations, a training and study akin to, but very different from, the preparation which had for centuries been required of those who would practice the learned professions—this idea came later. But it did at last come, and in its train a great number and variety of schools of an entirely new class—schools scientific, schools technical and polytechnical, schools industrial and professional, institutions whose name already is legion, and yet whose number rapidly increases in all lands.

Hundreds of these schools were in some form represented in Classes 89 and 90 of the Exposition, and hence required attention. But if they

had not been represented, their vast importance to the world, and the interest awakened in them in all civilized countries, would demand for them a large share of consideration.

I.—SCHOOLS OF THE ARTS AND TRADES.

To the careful observer no feature of the Exposition was more instructive than the direct relation discoverable between the representative exhibits of a large class of industrial and technical schools, and the products of manufacture displayed in several departments, designed merely to illustrate the progress of industry. It was not the relation of harmonious development merely, but, as between the schools themselves and those industrial departments referred to, it was manifestly the relation of cause to effect. For nothing could be plainer than that in proportion as such schools had been established and fostered by a country, that country had made progress in those particular branches of manufacture for whose advancement they were originally established.

Thus, as early as the latter part of the last century, schools created for the purpose of furthering development of the arts began to spring up in many portions of France and Belgium, and in some other countries—schools for instruction in the arts of designing, engraving, coloring, dyeing, silk and ribbon weaving, lace-making; of the making of horological instruments of various kinds; stone-cutting and general carving; of manufacturing the most delicate patterns and elegant forms of glassware; of working the metals, both useful and precious, into nearly every variety of form, for the consumption of the most refined and cultivated nations—schools, likewise, of various grades for instruction in the principles and practice of the more complex and comprehensive arts of mining, engineering, agriculture, &c. To-day it is undeniable that, in nearly all the branches of industry named, in every one, I will venture to say, for improvement in which special educational effort has been made, those countries are the acknowledged leaders of all others.

These remarks are eminently true in their application to the influence of schools of design in which France, more than any other country, abounds, and from which, in the whole range of artistic manufactures, all the other nations have so long been borrowers.

And yet France affords scarcely a better illustration of the general remark above made than England, the clumsy attempts of whose workers in glass and fine pottery, as well as in the precious metals and in certain kinds of figured prints, silks, &c., even as late as the first exhibition, were less remarkable as competitive failures than has been her rapid progress in all those branches since that period; when, being fairly aroused to a realizing sense of the causes of the superiority of France in nearly all the finer arts of manufacture, the British government began in earnest to found and encourage the establishment of similar schools in various portions of the United Kingdom.

Of the number, distribution, and character of schools of lower grade

for the improvement of the arts and trades, I must content myself with the general statement that, in France and Belgium, where, as a class, they may be said to have originated; and in Switzerland, Holland, and all the German states, into which they spread, or in which they sprung up almost cotemporaneously, they are numbered in the aggregate by thousands—some of them extensive enough to accommodate pupils by the hundred, and exerting a very marked and important influence upon large districts of country. In the countries first named they occur in some form in nearly every large town; while in some of the larger cities they are even numbered by the dozen.

Many of the schools in question are for the instruction and practical training of youths—boys or girls, or both—in some single branch of manufacture. Many are, likewise, for the practical education of adults in those applications of mathematics, mechanics, and chemistry, a knowledge of which is essential to one or more kinds of industry. Others embrace a wider range of scientific study, and are open alike to both youth and adults above a minimum age.

As to support, some are maintained wholly by the government; others receive only a moderate amount of state aid; a large number—especially of such as are more strictly industrial, and are confined to individual arts—are private institutions, managed on the sole responsibility of their founders; while some of the most important and most flourishing, under the general title of apprentice schools—being designed to induct boys and girls between twelve and fifteen years into the best methods employed in various trades, at the same time that they are taught the principles that underlie those occupations, and thus, at the expiration of two or three years of study and labor combined, they are prepared to enter, with greater advantage, as regular apprentices into the practical study of their chosen pursuits—are established, directed, and supported by philanthropic societies.

Of the multitude of these primary technical schools at present found in all European countries, none are more interesting perhaps than those which have been established within the few past years in Belgium, as at Roulers, Ghent, Ath, Wacken, Courtray, Deerlyk, and many other points. From being foremost in the spinning and weaving of flax, (employing, it is said, no less than 220,000 spinners and 57,000 weavers as late as 1830,) Flanders was reduced, by the introduction into other countries of labor-saving machinery, which has characterized more recent times, to a condition of actual distress. Stimulated by the necessity to do something to rescue this branch of its industry, and at the same time ameliorate the condition of the poor working-people of Flanders devoted to this and other branches of industry, the government of Belgium conceived the idea of establishing, at certain points, industrial establishments in which, at the heads of the several departments, should be placed skilled and educated foremen, while the youths of their respective neighborhoods should be allured from the streets and the haunts of vice by pay for

labor carefully performed under this wise and kindly supervision, and, at the same time, instructed by competent teachers each day, for one, two, or three hours, first in the rudiments of learning, and then, in connection with their work, in the scientific principles involved in their several trades.

By this means great numbers, who without stringent compulsory regulations would grow up in utter ignorance and enter into the devious paths of wickedness, are now being at once technically, intellectually, and morally trained for careers of usefulness; while, by means of the frequent conferences required of the heads of practical departments in the various schools of the same general district, for the discussion of methods and the diffusion of a knowledge of the latest improvements, much progress has also been made by the industry of the whole country.

Schools for the technical education of girls, and even of adult females—of whom the number devoted to the many operations of spinning, weaving, lace-making, embroidering, &c., is so great in Belgium—have likewise been established within the past five years in many parts of this busy little kingdom.

Were I to attempt an account even of the more interesting examples of this class of schools, as found in the different countries, this single chapter would swell to a volume; for such interesting examples are almost as numerous as the manufacturing towns of Europe.

As a means of improving the social condition of individuals and populations, by affording the means of profitable employment to thousands who would otherwise suffer from want, they are hardly less interesting than as potent agencies for the advancement of a multitude of handicrafts, in the perfection of which the whole world is interested.

Schools for technical instruction established, directed, and sustained by voluntary associations on philanthropic grounds, found their most interesting illustrations at the Exposition in the contributions made by various institutions of France and Holland; among which, those located at Strasbourg, Mulhouse, and Amsterdam, possess peculiar interest as showing in a very satisfactory manner their ameliorating influence upon the industrial condition of localities.

Of schools of this class we have but few, if indeed any, in the United States. They have been an incalculable blessing in European countries; and although the character of the people and the condition of the arts are quite different here, it may, nevertheless, be well for the municipal authorities and benevolent persons of large means to consider whether numbers of the children now growing up in their midst in ignorance, pauperism, and crime, could not, through this double agency of training in the rudiments of education, and also in the processes of skilled labor, be both saved from ruin and made useful members of society.

Next in grade above this numerous class of what may be considered the elementary schools of industry, we have another class, still primary in their general character, and yet aiming at higher educational and

practical results than the training of poor children for individual service. Reference is made to the class of schools known in almost all countries where they are found by the title of schools of arts and trades.

THE RUSSIAN SCHOOL OF ARTS AND TRADES.

One of the earliest founded of these schools is the Russian School of Arts and Trades at Moscow, which had its beginning under the reign of the Empress Catharine, in 1775. At its origin it was designed, by means of general and technical instruction, to fit poor orphan children for the mechanical pursuits. Since that date, however, it has been expanded in aims and resources, having for its present object, as molded and sustained by the reigning Emperor, the formation of constructing mechanicians and skillful technologists.

The entire course of study occupies five years, but is so divided into, first, a theoretical and practical course, (elementary in character,) which embraces three years, and, secondly, a special superior course of two years, that many young men, already qualified to enter the second division, may there fit themselves for practical business in two years. Adhering, in part, to the original purpose of the beneficent founder, provision is still made by bursaries for the full support of 100 foundlings, and 150 poor youths and orphans; while the school is also open to boarding pupils, who pay $40 per annum, and is, furthermore, attended by an average of 150 day pupils, devoted to studies in the special course.

The instruction is given by fourteen professors in the theoretical departments, assisted by a competent force of practical mechanics and technologists in the workshops and laboratories, which are both numerous and extensive. The five principal workshops—a foundery, forges, shops for setting up machinery, the finishing shop, and the model room—are provided with lathes for wood and metals, powerful machines for cutting up the various materials, trip-hammers, and various tools and machines driven by steam; so that the pupils, working by classes and in harmony with the educational plan of the institution, are enabled, by their own manufacture, to fill orders to the average amount of $40,000 per annum, thus returning to the treasury a part of the $100,000 annually expended for the support of the institution. The school includes, besides these several workshops, a very large laboratory for technological operations and for chemical analysis; a museum of models and of mechanical and technological apparatus; collections of raw materials used in manufacture; a geological and mineralogical museum; and a valuable scientific and technical library, comprising several thousand volumes.

Some of the products sent by this school to the Exposition, and displayed under Group VI, in the Russian department, afforded excellent proof of the high and progressive character of the teaching, and contributed to that favorable opinion of Russian progress in industrial education which led the International Jury to award to the technical schools of that country, as a class, the honorable distinction of a silver medal.

SCHOOLS OF ARTS AND TRADES IN FRANCE.

Scarcely less interesting, as representative of this important class of technical schools, are the three schools of arts and trades at Chalons-sur-Marne, Angers, and Aix, which had their origin in the foresight and will of Napoleon I, when First Consul, and have since successively become centers of important influence upon the industry of Eastern, Western, and Southern France. At present they are under the general control of the minister of agriculture, commerce, and public works, upon whose recommendation large sums of money—amounting in some cases to over $200,000 for the three—are annually appropriated from the imperial treasury. Their object is to furnish to the country educated and skilled chiefs and foremen of workshops in several branches of the useful arts.

In order to be admitted, the applicant must be French, between the ages of fifteen and seventeen, and be approved by the board of examiners appointed for the department where he resides, who are required to demand satisfactory evidence of proper age, of vaccination, of good constitution, free from scrofulous taint, of having been an apprentice to a trade analogous to those taught in the school, of good moral character, together with a legal engagement, signed by his parents or guardian, to meet the expenses of personal maintenance while at the institution, and a declaration *visé* by the mayor or commissioner of police, indicating the residence and occupation of his parents, their condition in life, the number of their children, and the particular claims which recommend them to the good-will of the government.

The examinations for admission are in reading, writing, orthography, arithmetic, (to and including fractions,) the first principles of geometry, and design. When those candidates who have passed this examination by the board report themselves at the school, they are again examined, when such as are unqualified, or of too feeble constitution, are returned to their homes.

The course of instruction occupies three years, and is both theoretical and practical—the theoretical part embracing the French language, writing, machine-drawing, arithmetic, geometry, mechanics, chemistry, and physics; the practical, actual service at the forge, in the foundery, and various workshops.

For the benefit of promising but indigent youths, the government grants a certain number of bursaries or stipends, fairly distributed, by the aid of which many of the most skillful workmen of the empire have thus been enabled to make their talents useful to the country.

The Central School at Lyons, though established and conducted without aid from the government, is no less in importance than those just named. It was established by a joint-stock company, with a capital of 250,000 francs, and is under the direction of one of its shareholders, assisted by a sub-director.

The course of study extends over three years, and is uniform for all who attend.

The subjects embraced in the curriculum are:

1. Mathematics—commencing with higher arithmetic and concluding with differential and integral calculus and analytical mechanics.

2. Physics—including general physics; industrial physics, with its applications to heating steam-boilers and accessories, and to drying and ventilation; telegraphic apparatus; electroplating; photography; meteorography, &c.

3. Mechanics—embracing an extensive range of study of prime movers, materials, and constructions.

4. Chemistry, general and industrial—especially its applications to dyeing, printing, commerce, and agriculture.

5. Civil engineering—comprising the study of materials used in building; their resistance and their use in masonry, road-building, embankments, &c.; construction of bridges, railways, locomotives and railway carriages; navigation; improvement of rivers, canals, locks, and weirs.

6. Natural history—including the organization and physiology of man and other animals; noxious and useful animals; general hygienics of man; dangerous and unhealthy occupations; contagious diseases, and how to avoid taking them; anatomy and physiology of plants; rural economy; agricultural machines; industrial plants; gathering and curing of crops; zootechny; domestic animals and their products; breeding; acclimation, &c.

7. Commercial law and accounts, in their practical departments.

8. The English language; commercial correspondence; weights, measures and coins of principal commercial countries.

9. Drawing—sketching of machines; drawing of ornaments; working drawings of machines; projection; tinted drawings; plans of machines.

10. Manufacture of textile fabrics, especially of silks—embracing natural history of silk; spinning, throwing, weaving, and testing of silks; sorting and cleaning; winding, warping, and beaming; putting up of looms; consequence of defects in operations; decomposition of tissues; and preparation of looms for weaving different fabrics.

11. Manual exercises in the workshops, such as joiners' work, turning, forging, fitting, &c.

12. Excursions to the various factories of Lyons and its suburbs.

The number of professors in this institution is 12, including the sub-directing, the aggregate of whose salaries is 30,000 francs; each professor's salary varying according to the importance of the course taught by him and the number of hours employed.

The capacity of the school for pupils is for something over 100. The number in actual attendance is very near this limit.

The charge to pupils for instruction, and use of workshops and laboratories, is 700 francs per annum. On the average, about two-thirds of the pupils pay the full amount; the remainder are aided by the Chamber of Commerce of Lyons, the council-general, the municipal council, and by the school.

On some accounts—especially in view of its entire independence of government aid, and yet its flourishing condition and great usefulness—this is one of the most interesting schools, of the class to which it belongs, that I have visited.

THE BUILDING SCHOOLS OF GERMANY.

In Germany there is a somewhat novel class of schools of this same general grade, *i. e.*, having about the same objects in view, known as building-schools, (*Baugewerbeschulen.*) There are different kinds of schools bearing this title, but those to which I refer are peculiar in that they have regular, protracted courses of study, and yet are held only during the winter; the object being to afford to practical mechanics, whose work cannot advantageously progress during the winter, an opportunity to commence and complete a systematic course of technical study, without an important sacrifice of time.

It has appeared to me that such schools might be opened with great advantage both to our mechanics and our industry in all the cities of the United States where mechanics of this class, though equal in native talent to any in the world, and capable, with proper technical training, of surpassing those of almost any other nation, are, at present, the least competent of all in those particular branches of the builder's trade that require a thorough acquaintance with the applications of science.

The period of annual study in these schools is usually about five months, beginning with the 1st of November. The full term extends through various periods, from two to four winters, and the pupils are divided into as many classes as there are terms or winters included in the course; by which means the teaching may be as systematic and—so far as success depends on a graduated system—effective as a continuous, full-year school.

Some of the building-schools—indeed, nearly all of them—are day schools; but in some cases—as, for example, where the location is a small town, and the demand for instruction is largely from mechanics residing in other places—a boarding establishment is kept in connection with them.

The school at Holzminden, in Brunswick, is an example of the boarding class. The establishment is extensive enough to accommodate 500 pupils, and there is rarely room to spare. The discipline is that of a regular college of a somewhat military stamp, the pupils wearing uniforms.

No pupils are received except such as are already engaged in some department of the builder's trade.

The cost of boarding and lodging for the twenty weeks of the term is less than $20; charges for tuition, fire and light, washing, medical attendance, and all requisite materials for writing and drawing, about $33; total expenses of the term, $53.

The course of instruction includes the following branches: German

language and correspondence; arithmetic and elementary algebra, with their applications; elements of physics and knowledge of materials; elements of mechanics, with their applications to building; details of the art of building; plotting; geometrical and ornamental drawing and modeling, (much time is devoted to this branch;) book-keeping; and excursions to examine buildings.

At the conclusion of the studies examinations are made and certificates awarded.

Nienburg, in Hanoverian Prussia, is the location of a day school of the same grade as the preceding, with 15 professors and some 200 pupils, including machinists and mill-wrights, masons, carpenters and joiners, cabinet-makers and locksmiths, as well as builders proper.

INDUSTRIAL SCHOOLS IN OTHER PORTIONS OF EUROPE.

Other portions of Germany, Belgium, Holland, England, the Scandinavian states, and, indeed, all portions of Europe, are now establishing so many schools, and classes of schools, for practical instruction in the mechanic arts, as represented by the trades, that, in reporting, one is rather at loss how to select from the multitude that crowd upon his attention.

A still higher, and the highest grade of technical schools appropriately considered under the general head of "schools of arts and trades," is notably illustrated by such institutions as the Institute of Arts, at Berlin, and the Central School of Arts and Manufactures, and the Conservatory of Arts and Trades, at Paris; examples of which are also found in Belgium, Saxony, Scandinavia, and Russia.

The Central School at Paris, at first an independent enterprise, then subsidized by the government, because of its great practical value to the empire, is now a state institution, under the general control of the minister of agriculture, of commerce, and of public works.

Its object is to qualify engineers for all branches of industry, and for such public works and service as do not necessarily belong to the engineers of the state. It is in fact almost a polytechnic school, though presenting less extensive and profound courses of professional study than some of the institutions of that class. It is open to foreigners as well as citizens of France.

Candidates for admission must be full seventeen years of age, produce the ordinary certificates of moral character, and succeed at a competitive examination bearing upon the French language, arithmetic, algebra, elementary geometry, plane trigonometry, analytical geometry, descriptive geometry, physics, chemistry, natural history, and drawing, linear, free-hand, and washing-in.

The examinations upon these subjects are both oral and written, and candidates are also obliged to execute a plan on the basis of descriptive geometry, and an architectural design of the ornamental kind, copied at a reduced scale from a given model.

The term of study is three years, and the course of instruction embraces, in addition to such mathematical and physical studies as are essential to a practical engineer, various branches of natural science, with special applications to various departments of manufacture.

It is exclusively a day-school; and the price of tuition is 800 francs per annum. Subsidies are granted by the state to pupils wanting in means, but at the same time distinguished by the manner of their passing the examinations and their rank in the school. The time for which subsidies are granted is one year, but they may be, and often are, continued to those who are especially deserving. Subsidies are also sometimes increased by amounts granted in aid of pupils by the communes and departments in which they reside. These subsidies are paid into the treasury of the school, however, and if the total amount should exceed the cost of instruction of the pupil to whom accorded, one-twelfth of the surplus is paid to him each month to aid in paying his board.

At the expiration of each year there are very rigid examinations of all the pupils of the school, but more especially of those who, having completed the full term of study, are candidates for graduation; after which all who acquit themselves satisfactorily in all the departments of study, and in all branches upon which they are examined, receive the diploma of engineer of arts and trades. Such as fall short of this high mark, but yet pass a good examination on the most important branches, receive certificates of capacity.

This important school has exerted an important influence, not only in France, but in other countries, several of which, including even Egypt, have chosen it as their model in forming plans for similar institutions.

The Conservatory of Arts and Trades is no less distinguished than the Central School just considered, though very unlike it in the character of its organization.

In this institution, the extensive museum of models of an industrial kind, collections of designs, &c., together with free courses of scientific and practical lectures, are characterizing features.

Besides all these several classes of schools established in the interest of industry, and providing regular courses of training, with scientific and practical instruction variously given, there is another important class of instructional agencies which should by no means be overlooked in this endeavor to present a bird's-eye view of what the nations of the world are doing educationally with the direct object of promoting their industries and improving the intellectual character and physical and moral condition of their working classes. I refer to the large number of mechanics' institutes, industrial museums and associations, under whose patronage popular courses of lectures on scientific subjects, together with personal instruction in drawing and in the applications of science to the arts, have become so valuable an auxiliary to the teaching of the schools.

These agencies are now in operation, in some form, in almost all

enlightened and progressive countries; but in no part of the world do they seem to have been so successful as in France, portions of Germany, Great Britain, and the United States.

The *Association Polytechnique* and the *Association Philotechnique* of Paris, the first of which has been in operation some forty years, and may be considered a pioneer in this philanthropic field, and both of which have reckoned among their active members many of the most distinguished scientists and statesmen of France, first challenge attention.

Both are purely voluntary organizations, formed by numbers of learned and practical men combined in the interests of science, of humanity, of the city of Paris, and of the empire. Each has its bureau, its halls for reading and study, its amphitheaters, and its courses of lectures and other forms of instruction for students of the French, German, and English languages, legislation, accounts, arithmetic, geometry, algebra, trigonometry, descriptive geometry, topography, design, geography, hygiene, physics, chemistry, mechanics, astronomy, and singing.

The lectures and other instruction are gratuitously given by able teachers, on certain evenings of the week, (usually four or five,) and on Sunday and various holidays, when the laboring classes, for whose benefit they are designed, find it easy and agreeable to attend. The exercises are often varied by interrogations, discussions, illustrations, experiments, &c., so as to keep up the most lively interest on the part of all concerned.

In order that persons who wish to pursue a systematic study of certain branches may be enabled to do so to advantage, a regular programme of exercises is adopted, published, and adhered to on the part of those who give the instruction with as much regularity as is usual in an ordinary day-school.

But in so great a city as Paris, one such association would prove very inadequate to supply the demand, especially among a people so active in mind, enthusiastic, and eager for knowledge as are the French; and so each of those organizations has originated a number of subordinate associations, all acting simultaneously under its lead, in as many parts of the city and its precincts. The present number of these branches under the lead of the Polytechnic Association is nineteen; the number thus far organized by the other association is twelve. By this multiplication of themselves, the population of the city and vicinity have a total of no less than three hundred and twenty-two courses of instruction in the various branches above enumerated, in simultaneous progress. Nor does this express the sum of the efforts made by these vigorous and philanthropic organizations; for both of these have extended their patronage and stimulation to the neighboring departments of France; so that the real number of sections or sub-associations having delegate membership in the central organizations is forty-nine, the pupils in attendance upon whose courses can only be reckoned by thousands.

ASSOCIATIONS OF ARTISANS, BERLIN.

The Association of Artisans of Berlin affords another example of associated effort to diffuse a knowledge of science among the working classes. It differs from those of Paris in that it asks of those who attend its courses to contribute such small amounts as they can afford toward the support of the organization, whose motto is, "Help yourselves."

The regular instruction includes evening studies in reading and writing, literature, mathematics, design, book-keeping, French, English, and gymnastics. The special courses are given on stated evenings and on Sundays, and although mainly occupied with technology, industry, commerce, and natural sciences, also include occasional lectures on political economy, jurisprudence, architecture, history, and literature. The workmen and others are invited to present any difficulties that seem to require explanation, and the professors endeavor to explain them. The lectures are given by professors from the university and the scientific and technical schools, by distinguished economists, merchants, public engineers, mechanics, manufacturers, and members of Parliament; all classes seeming to vie with each other in the zeal with which their generous service is performed.

The number of persons receiving instruction each half year is about 1,000.

The number of mechanics' institutes and industrial and scientific organizations established within the past few years in Great Britain, all having this same end in view, is very considerable. The most important of them are found at London, Birmingham, and several other of the large interior towns, Glasgow, and Dublin.

The instructional means employed are reading-rooms, libraries, and lectures. Some of these courses of lectures are very largely attended; perhaps none more so than those given under the patronage of the Royal Society of Dublin and the Museum of Irish Industry at Dublin, which sometimes have been attended by over 6,000 persons during a single year.

In some of our large cities in the United States we have mechanics' institutes that perform more or less perfectly the same general office of educating our American artisans by means of libraries, reading-rooms, and night lectures on applied science—an office well fulfilled by at least a few of them, as I can testify from personal observation. But it is very questionable whether any of them are doing the thorough work, by evening lessons and studies, as well as popular lectures, that is being done in Paris; and then many of our cities are doing no generous work of this kind at all.

II.—SCHOOLS OF APPLIED ART.

Popular education in Europe is characterized even more by the extent to which the elementary principles of drawing are taught in the com-

mon schools, of every grade, than by the teaching of the applications of science to the industrial arts.

FRANCE.

For many years France had the lead in this branch of instruction, and she still claims to be in the ascendant, though several of the other nations are about ready to, if they do not now, dispute this honor. Being eminently an artistic people, it was natural that the French should be the first in the field with the products of all those branches of industry to which art, in its different departments, is most readily applicable; nor is it strange that, once being acknowledged supreme, they should have taken much pains, by the establishment of schools of industrial or technical art, to perpetuate their ascendancy in this pleasant and profitable department of the national industry. But, after a long while, during which there seemed to be no disposition on the part of other nations to question their right to the world's markets for their beautifully-designed silks, ribbons, laces, tapestries, ornaments, ceramic manufactures, &c., they seem to have taken it for granted that the nine-tenths principle would give them permanent and undisturbed control; and so gradually began to neglect those very measures without which supremacy was impossible. For, encouraged by the final monotony of style into which French technical art had fallen, the Germans, Swiss, Russians, and, by no means least of all, the English, have found that they, too, have a capacity for that same sort of work; and, since that conviction first stole over them, in 1851, have been most industriously employed in making themselves ready to rival the fine products of French genius. How well they are succeeding, the Exposition of 1867 was a convincing witness.

All over Europe this artistic spirit has been diffused to such an extent that almost every city has its day and night schools of design, and every industrial school its trained teachers of the elements and the applications of art.

GREAT BRITAIN.

In Great Britain this development has been even more surprising than on the Continent, especially during the past ten years. The work has been under the direction of the Science and Art Department of the Committee of Council on Education, whose enterprise has been so great that, from having, but a few years since, almost no schools of art at all, the United Kingdom now has no less than 92 such schools in almost as many towns, with 17,341 pupils under instruction, and 73 night-classes for instruction in drawing in 60 of the principal towns, with a total of 2,547 pupils. I should not omit to state that the above-recited figures are simply intended to show the number of pupils in attendance on all the schools on a given day, not the number of persons who receive instruction in art during the year, of whom the number is usually between 90,000 and 100,000.

As at once illustrating the plan of this English science and art department for the advancement of industrial art, and showing the present position of France as appreciated by one of her own citizens, I am induced to give the following quotation from a report just made by a French commission appointed under a recent decree of the Emperor:

"The institutions dependent on the science and art department are divided into two categories:

"1. Public teaching: Embracing schools of art and local associations of primary schools for teaching drawing; annual inspections of the local schools and primary schools combined in associations; annual local competitions; central museum at Kensington; loans of models and books on art from the museum to local schools; exhibition in the localities of the articles thus lent; pecuniary grants to the local schools for purchase of models, and, in certain cases, toward the expense of first establishment.

"2. Training of art masters: Examinations of fitness, and graduated certificates; free admission of exhibitioners from the schools of art, and of pupil teachers intended to become art masters; normal school of art; certificates to teach elementary drawing, given upon examination to primary school-teachers of either sex.

"Notwithstanding this organization, which would seem to indicate that the art department has become a sort of university for teaching drawing—acting like the French University for literature and science—the action of the department is limited to encouraging local or private foundations, to directing their efforts, to preparing and training capable teachers, and to indicating by general programmes the proper course to be pursued.

"The summary programme of the central schools of drawing is as follows:

"1. Elementary course: Geometrical drawing; linear perspective; free-hand drawing, with shading; drawing from relief; figure drawing from lithographed or engraved models; principles of water-color drawing.

"2. Superior course: Drawing from relief; painting; ornaments; flowers; still life; landscape.

"3. Special or technical course: Art anatomy; elementary composition; designing; modeling; architectural and machine drawing."

SOUTH KENSINGTON MUSEUM.

"Everybody knows the magnificent art museum at South Kensington, for the founding of which the science and art department has collected from all quarters master-pieces of every kind, at a total expense to the state of not less than a million sterling since 1852. Besides this outlay for first establishment, the department has a yearly grant of £80,000 sterling.

"By the extent of the resources placed at the disposal of this special and new department, created for the purpose of enabling English industry to compete with ours, an opinion may be formed of the importance

rightly attributed in England to the participation of the art of design in all industrial productions, and no surprise can be felt that such efforts have called attention, in France, to the necessity of maintaining, among ourselves, that superiority against which the foreigner sought to struggle by giving a greater development to the teaching of drawing.

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"England is not the only rival of French industry which has recognized its superiority with regard to works which require the aid of art and taste. Germany, moved by the same sentiment, has organized since 1852, at less cost, but perhaps with as much success, drawing schools of different grades. In all the practical schools, and in the polytechnic institutions, the teaching of drawing holds a prominent place; and almost everywhere the method which had been systematically organized by the late M. Depuis is successfully followed—a method which consists in habituating the pupil, as soon as he can well hold a pencil, to draw from models in relief, or from natural objects.

"The drawing, which is justly regarded as the best in Central Germany, is that of Nuremberg, the director of which has laid down the principle that, to become a skillful industrial interest, it is indispensable first to study art in all its varieties. Under his energetic supervision a great number of professors and artists have been trained, who have disseminated good methods, and have brought about in the productions of industry, especially in those of Nuremberg, a most remarkable artistic improvement."

WURTEMBERG.

"In the kingdom of Wurtemberg, the department of commerce and industry has organized, in nearly every town, classes for drawing, modeling, and sculpture in wood and stone. These are often conducted by workmen who have become sufficiently skilled, and who, without abandoning their profession, undertake the duties of teachers in the evening. Annual exhibitions of the drawings executed by pupils are held at Stuttgart, when rewards and prizes are awarded to the pupils and masters who present the best works.

"Beside the study of artistic drawing, properly so called, that of linear drawing, based on geometrical principles, has also been widely extended in Germany. Descriptive geometry is taught elementarily, and with entirely practical applications, in the drawing classes opened for artisans, where they also acquire the theory of projections.

"Collections of technical drawings relating to the working details of the more important manufactures, and generally executed in a very good style, were communicated to the members of the commission who visited Germany, and may be consulted with profit by those who undertake to organize classes of the same kind for young workmen.

"All these efforts, made by countries which are our rivals in industry, must not be overlooked by us; and however great our confidence in the

superiority of the national taste, it is desirable to keep a watchful eye on the progress made abroad. The impression which this progress has made on a few enlightened friends of our industrial arts is very strong; and fears, perhaps a little exaggerated, have been expressed that France may be in danger of losing the lead in matters of taste. On this subject one of the members of the commission, most competent to form an opinion on the gradual, continuous, and ever-ascending progress of industrial art in France, has given convincing information. He asserts that this superiority is constantly maintained to the same extent, and that if our public exhibitions occasionally display productions of doubtful taste, such a circumstance does not show, on the part of our manufacturers, any contempt for the rules of art, but is simply the result of concessions made to the necessities of trade. Nevertheless, though this information justifies us in retaining, in spite of the progress made by foreign rivals, full confidence in the superior taste of our artists and of the public, in the midst of whom they live and often find their inspirations, it is still necessary to take into account the considerable development which, since the late universal exhibitions, the teaching of drawing has received abroad, especially in England and Germany."

APPLICATIONS OF THE FINE ARTS IN THE UNITED STATES.

In view of our own recent origin as an independent nation, and the necessity there has hitherto been in America for the exercise of the ruder and, so to speak, heavier mechanical arts, to the exclusion of the finer arts, it is not to be wondered at that almost nothing has yet been done by us in the direction of a cultivation of art in its character of pureness, or in its industrial relations. The time has at length arrived, however, when we should begin a systematic endeavor to establish our claim to a position with the older nations of Europe in many of the higher and more artistic departments of manufacture. What we have already essayed in this direction has afforded the most satisfactory evidence of a native taste and genius, which, if carefully cultivated, will leave us nothing to envy any nation, not even France, in this regard.

In this work of art development, if undertaken without too much delay, we shall be only a little behind most other countries in time, and with the superior general intelligence of our working classes, and that peculiar aptness and ingenuity for which our people are justly noted, we would have an advantage which time alone could not offset. The economical argument, therefore, strongly re-enforces the æsthetic one presented in the chapter on schools of art; and both together demand, with a voice that should be heard and heeded, the prompt adoption of measures for providing instruction in the elementary principles of drawing and modeling in all our public schools, and in the industrial applications of art in all our schools of applied science.

CHAPTER VII.

APPLIED SCIENCE SCHOOLS.

I. Schools of chemistry—The great number and extent of the schools in Europe—Courses of instruction—Schools and instruction in the United States—II. Schools of agriculture—Austrian school at Krumau and at Prague—Russian schools—Saxony—Wurtemberg, Royal School at Hohenheim—The School of Practical Farming—Agricultural schools connected with other institutions—Bavaria—Ireland—Russia—Great Britain—Belgium, Germany and other parts of Europe—Agricultural education in America—III. Schools of forestry—IV. Veterinary schools—V. Schools of Mines—Austrian school at Chemnitz—Saxony, Mining Academy of, at Freiburg—Prussia, Clausthal—Sweden—Russia—Imperial School of Mines of France—Great Britain—United States—VI. Schools of engineering—VII. Schools of architecture—VIII. Schools of navigation.

I.—SCHOOLS OF CHEMISTRY.

The number of schools of chemistry in all the European countries is already very considerable; and yet the growing demand for careful analysts and technological chemists, made by every department of industry, necessitates a steady increase. In nearly all the polytechnic institutions chemistry constitutes a school, as also in many of the universities; besides which there are many like schools, though less complete and comprehensive, existing in connection with private laboratories.

The number of schools of chemistry must, of necessity, be greater in proportion to the number of students than of other professional schools, for the reason that so much of the teaching must be personal, and that so much of the study consists of practical operations in the laboratory. Unless the laboratory be very extensive—a condition involving great expense—no distribution of time among pupils will render it possible for a very large number to receive instruction in one school.

Usually the number of separate places for practical study in a laboratory does not exceed thirty or forty, and it is often less. The largest number of which I have knowledge—and I have seen those connected with all the leading universities and technical and polytechnic schools of Europe—is found in the laboratory of the Federal Polytechnic School at Zurich, in which there are accommodations in all the departments—inorganic, organic, and technical—for about one hundred students. The accommodations are also very extensive, and of superior character, at Carlsruhe, Paris, London, Munich, Vienna, Berlin, Heidelberg, Jena, Bonn, and St. Petersburg. Formerly Giessen was a great center for the ingathering of students of chemistry; but that was in the days when Liebig, who then resided at Giessen, drew to his brilliant discoveries the attention of all Europe. Subsequently, however, this interest was transferred to Munich, where that distinguished savan now resides.

The term of study in most of the schools of chemistry is two years; though in some—as in the chemical department of the Royal Polytechnic Institute of Vienna—it is three years.

The subjects taught, with the time devoted to each, though varying somewhat in different schools—in the most important period of study is two years—are substantially the following:

First half-year: Important selections from inorganic chemistry, two hours a week; experimental physics, with technical bearings, six hours; chemical technology, particularly in directions demanded by the locality or country in which the school happens to be placed, three to five hours; study of machinery employed in chemical manufacturing, with examinations, three hours; analytical chemistry, two hours; mineralogy, four hours; principles of general botany, three hours; zoology, with repetitions, six hours; analytical practice, nine hours; technical drawing, four hours; experimental chemistry, six hours.

Second half-year: Organic chemistry, six hours; analytical chemistry, two hours; metallurgy, two hours; chemical technology of building materials, one hour; practice in technical laboratory, twelve hours; technical drawing, four hours; special botany, (obligatory upon students preparing for pharmaceutical practice,) six hours; general zoology and anthropology, (obligatory upon students with technical aims,) three hours; study of important economic plants, (obligatory upon students with technical aims,) two to three hours.

Third half-year: Chemical technology, (obligatory upon technical students,) four hours; mechanical technology, (obligatory upon technical students,) three hours; applied crystallography, (obligatory upon technical students,) three hours; technical geology, two hours; technical practice, (obligatory upon technical students,) twelve hours; technical drawing, (obligatory only upon technical students,) four hours; pharmaceutical chemistry, (obligatory only upon students aiming at pharmacy,) three hours; pharmaceutical botany, (obligatory only upon pharmaceutical students,) three hours; analytical practice, nine hours.

Fourth half-year: Lighting and warming, two hours; exercises in the technical laboratory, twelve hours; chemical technology of the ordinary trades, two hours; analytical practice, twelve hours; determination of minerals, three hours; pharmacology, (obligatory only upon pharmaceutical students,) two hours.

The usual number of professors giving instruction in the most complete European schools of chemistry is from six to twelve.

It is a department of science from the first remarkable for the large number of distinguished men who have devoted themselves to its development, it is also true to-day that a full list of the professional chemists of the world would present a larger proportionate number of great names than almost any other profession.

As yet we have no complete distinctive school of chemistry in the United States, but extended and thorough courses of instruction, in both general and analytical chemistry, are given in several of our schools of

science connected with the older universities, as, for example, at the Sheffield School of Yale, the Lawrence School at Harvard, and the School of Mines at Columbia College, New York. At all of these institutions the laboratory accommodations are extensive and superior, the instruction is ably given, and is adapted to the practical wants of the country. Yet, until within a few years, most of our young men who have chosen chemistry as their profession, and have desired to thoroughly qualify themselves for its practical duties, have felt obliged to study in the Old World. In my visits to the great laboratories of Germany and Switzerland I have failed in but few instances to find one or more—sometimes a dozen—American students at work in them. Indeed, it is chemistry, more than any other department of study, that attracts our young men to the European schools.

This supposed necessity for crossing the ocean to gain a mastery of the best methods of analytical and technical chemistry ought not to exist. The instruction in these branches in our best American schools of science is given by gentlemen who, by their studies and original contributions to science, have justly acquired a high reputation among the leading chemists of Europe; and it may be questioned whether all who go to Europe for study in the famous laboratories come back really better qualified than might have been the case if they had limited their ambition to certain American schools, maintained in connection with our leading universities.

But after all, it is undeniable that we are still relatively deficient in this department of education to a degree that ought to awaken more interest, and warmly enlist the practical sympathies of State governments and men of wealth, jealous for the national honor.

II.—SCHOOLS OF AGRICULTURE.

Agriculture, though first among the occupations of men in the order of time, and the most complex and difficult in actual practice, for the reason that it touches the domain of every science, and cannot, by any possibility, except upon virgin soils and under a combination of the most favorable circumstances, attain to the highest success until it shall have mastered the principles of each and brought them into its service—agriculture, first among the arts in importance, and surely destined in the further progress of the race to be first, also, in rank and honor, has been the very last to acknowledge its dependence on the sciences, and so avail itself of their teachings. But conviction is coming at last; and to-day no educational question occupies more of the attention of the educators and statesmen of civilized nations than how to organize and operate institutions and other agencies for the development of agricultural science and the diffusion of its light among the groping millions who cultivate the soil.

For many years after the development of true chemical and physiological science, and the dim recognition of its applicability to agriculture,

the only instruction in any sense professional, or that had direct bearing upon the agricultural art, was given from single chairs tardily established in here and there a liberal institution in the Old World.

One of the first of these tentative efforts to elevate and advance agriculture had its origin at Alfort, near Paris, where, in 1785, the illustrious Daubenton established, in the veterinary school, which still flourishes there, a "course of agriculture and rural economy." Subsequently, in 1793, the celebrated Thouin founded at the *Jardin des Plantes* of Paris a "course of vegetable physiology applied to culture." Both of these endeavors were successful and the chairs then established have continued to the present time, having been occupied by scientific men of high distinction. Nevertheless, the first Napoleon, when he undertook the reorganization of the public instruction of the empire, and provided for the establishment of several special schools, so far underrated the practicability of making special schools of agriculture successful that they were not included in his plan. And thus the initiation of that great enterprise which has since commanded the confidence of every enlightened nation of the world was left to other powers.

To Prussia, Switzerland, and Austria belong the honor, in common, of founding the first schools specially designed to give instruction in the applications of science to agriculture; the school founded by the illustrious Thaer, at Celle, in Prussia, the one established by Emanuel von Fellenburg upon his estate at Hofuyl, near Berne, and the agricultural academy founded upon one of his immense estates at Krumau, in Bohemia, by Prince Schwartzenburg, all three dating from the same year, to wit, 1799.

The Swiss school, so successful for nearly half a century, not only as independently considered, but likewise as a model for hundreds of other institutions with similar aims, soon after the death of its founder, in 1844, began to languish and at last virtually discontinued its labors; and Thaer's school was removed to Mogelin in 1806.

AUSTRIAN SCHOOLS.

The Austrian school at Krumau, on the other hand, still holds its place among the leading schools of the present time. Being established on an immense estate, (originally embracing 300,000 acres,) its natural facilities for imparting a knowledge of practical forestry and the management of large estates have been superior; while great pains have been taken to furnish other auxiliaries in the form of extensive collections of agricultural implements and machines, as well as of the cultivated plants of the country, and of fruits, noxious insects, &c. The instruction is gratuitous and is usually well attended.

At Prague, in 1803, was founded another institution. Nor did the government of Austria rest content with the erection of these two schools, but in 1809 founded those of Gratz, Lemberg, Trieste, and Trutsch, and has from that time to this continued to multiply them in

various forms, adapted to the special needs of different sections of the empire, until now they are found in nearly or quite all the provinces.

Among the separate and distinct schools of agriculture in Austria, the Imperial and Royal Agricultural School of Hungary at Altenburg is of high rank, and was, moreover, the representative of its class at the Exposition. It is a superior or academic school, and to the general course in agriculture adds a course in forestry. The attendance of pupils in 1867 was 147; the instruction being given by nine professors, with the aid of superior facilities in the way of a chemical laboratory, a large and valuable library of scientific and practical works, numerous mechanical and technological collections, and a botanical garden.

Among other objects of interest sent to the Exposition by this school, a complete collection of specimens and models, illustrative of the production of Indian corn, (the leading staple of that portion of Hungary,) its chemical constituents and the various transformations it undergoes from the moment of planting until the product, in its many forms, is ready for consumption, together with interesting botanical collections, samples of soils, with the results of their chemical analysis, and with numerous designs, charts, &c., all prepared by the pupils, afforded good evidence of the zeal and proficiency of the pupils there taught.

The term of study includes four half-year semesters, during which, in systematic order of succession, the following branches of study are taught as thoroughly as the time will allow: Practical geometry; general mechanics; agricultural implements and machinery; general and agricultural chemistry; climatology; mineralogy; knowledge of soils, *(Bodenkunde;)* the anatomy and physiology of plants; orchard, kitchen, garden, grape, and hop culture; forestry; zoology; anatomy and physiology of domestic animals; general and special breeding of domestic animals; diseases of domestic animals; farm management; science of valuations and book-keeping; technology; architecture; local agricultural relations and circumstances; national economy.

The applicant for admission must be at least seventeen years of age, possess good moral character, and have completed the course of study embraced in the first seven classes of a gymnasium or the first five classes of a real-school, or have completed the entire course in an agricultural middle-school, (school of second grade.)

The Superior Agricultural School at Gratz, though one of the most interesting and successful that I have found in Austria—having courses of instruction, by nine professors, in mathematics; mechanics; physics; botany; zoology; mineralogy; geology; chemistry; agriculture, and forestry, with fine collections in natural history, &c.; a silk-worm house, and a beautiful botanical garden; likewise embraces a school of mines—belongs rather to the class of polytechnic schools, of which notice will be made in a subsequent section. It is also true of a large proportion of the schools more recently established, including those of secondary grade, that they exist in connection with either general instruction or with other special courses or schools.

Special Austrian schools of forestry are found at Mariabrunn, near Vienna, and at Schemnitz; neither of which, however, is very noted.

PRUSSIAN SCHOOLS.

In number the Prussian schools of agriculture have outstripped those of Austria; the total of different grades being over fifty, while the latter power numbers not to exceed forty. Only eight or nine are of superior grade, however, and most of these are more or less intimately connected with universities; as, for example, the ancient school of Mögelin, near Potsdam, whose director is at the same time the leading professor of agriculture in the University at Berlin, the Academy of Agriculture and Forestry at Eldena connected with the University at Greifswald, the Agricultural Institute of the University of Halle, and the Agricultural Institute at Weiden, connected with the old University of Göttingen, (also Prussian since 1866.)

Those of Mögelin, Eldena, and Weiden are located upon large farms; while the institute at Halle occupies but twenty-five acres, merely enough for experimental uses.

Besides these different kinds of schools, Prussia abounds in what are called experimental stations, the object of which is to settle various scientific and practical questions connected with agriculture.

SAXONY.

Saxony comes next in chronological order, with its Academy of Forestry and Agriculture at Tharanadt, near Dresden, founded in 1811. This institution was at first almost exclusively a school of forestry, but now incorporates agricultural instruction as well. The term of study is either two or three years, at the option of pupils. The instruction is given by nine able professors, and embraces the usual branches taught in such institutions, with an unusual frequency of excursions into the forest and the best agricultural districts of the kingdom.

Besides the school at Tharanadt, there are four other agricultural schools and departments of schools in Saxony.

In both France and Wurtemberg there were established agricultural schools of the isolated and independent type, in the year 1818—the French institution by Dombasle, on his estate at Roville, and the Wurtemberg school at Hohenheim, near Stuttgart.

The first named, after many years of heroic effort, was finally discontinued in 1848 as a private institution, and converted into one of the regional schools of the empire, of which, besides the seventy or more elementary agricultural schools, there are three—the other two being at Grignon, near Versailles, and at Saulsaie, in the department of Ain.

Many of these schools I have visited, and, did space allow, would be glad to describe; but as I deem them, all in all, inferior to those of some of the other states, I shall omit such descriptions in accordance with the general plan of my report, which is to select for detailed account such schools as will best illustrate the most advanced conditions.

WURTEMBERG.

The Royal Land and Forest Academy of Wurtemberg has long held the first rank among the agricultural schools of Europe. It is located at Hohenheim, some seven miles from Stuttgart, upon an estate formerly belonging to Duke Charles, Regent of Wurtemberg. The buildings occupy a high swell of ground, commanding one of the most extensive and beautiful views in Germany. They include three open courts, rectangular in form, presenting a continuous front of one thousand feet; and, though the marks of nearly one hundred years, during which they have stood, are noticeable upon them, they nevertheless still make an imposing appearance and answer the more modern use to which they have been put exceedingly well.

The farm embraces between eight hundred and nine hundred acres, and lies in immediate contiguity to a government forest of five thousand acres, which thus affords extraordinary facilities for acquiring a practical knowledge of forestry as well as of agriculture. It is well planned, and conducted on the basis of a scientific rotation of crops, serving the double purpose of a model and an experimental farm. But the important work of experimenting is still more thoroughly carried on upon a subdivision of the farm known as the experimental grounds. These embrace some twenty acres, divided into about one hundred plats, upon which systematic experiments are conducted with the different crops grown in that portion of the continent as well as with new species and varieties supposed to be adapted to its soils and climate. It is upon these plats that are tested questions based upon soils and their preparation, manures and their application, methods of cultivation, harvestin &c.; questions of vital importance not only to the agriculture of Germany, but of the temperate latitudes everywhere.

Connected with these experimental grounds there is likewise an establishment which, together with them, is known as the experimental station. It is provided with chemical and other scientific apparatus necessary to all sorts of agricultural investigations, and is presided over by the chemical professor, with a responsible subordinate, who resides therein and gives constant personal attention to solutions of the problems attempted.

There is also a well-planned botanical garden embracing several acres, in which are grown all sorts of plants possible to the climate and soils of the location; a beet-sugar factory, a brewery, a distillery, a starch factory, a vinegar factory, a malting and fruit-drying establishment, a silk-worm establishment, and an agricultural implement and machine manufactory. The last-named is sufficiently extensive to employ some forty workmen; the design being not simply to afford the means of instruction to pupils in the principles and art of constructing implements for the uses of husbandry, but also to supply the different markets of Germany with the best models.

Considered as an institution of learning, the Royal Academy at Hohenheim consists of three quite distinct schools, to wit:

1. The institute, having the character and rank of a professional school of agriculture.
2. The school of forestry.
3. The school of practical farming.

The institute and school of forestry were designed for advanced young men, able to understand purely scientific lectures. As a general rule, the pupils are either the sons of the gentry, fitting themselves for the general management of inherited estates, or ambitious young men from the middle classes, looking to a stewardship over the estates of others. The requisites are the attainment of eighteen years of age, good moral character, proficiency in the preparatory branches, (equivalent to a common-school education in the United States,) and the payment for lodging, instruction, and incidentals, of $40 to $80 (foreigners pay twice as much as inlanders) per annum. There are accommodations for over one hundred pupils in the lodging apartments, and for an indefinite number at the restaurant connected with the institution. But if pupils prefer to take their meals and lodgings elsewhere they are at liberty to do so. So, also, each pupil may exercise his own discretion as to the number and kind of lectures he will attend, though industry, regularity of attendance, and a faithful use of the opportunities offered are urged upon all. In these respects they are subject to as little restraint as the students of our own professional schools.

The School of Practical Farming *(Ackerbauschule)* is designed for the sons of peasants, between the ages of fourteen and eighteen, who have familiarity with the ordinary routine of farm-work, and desire simply to acquire a knowledge of the general principles of agriculture and the most practical methods. They spend but two or three hours daily in gaining theoretical and scientific knowledge, and the remainder in actual labor on the farm, and in the other practical branches of the academy, under the direction of the practical foreman or immediate managers.

Besides these three distinct branches or departments, there are several special courses or schools, designed to give instruction in the principles and especially the practice of different branches of industry. These courses, as a rule, are only open to such as have already acquired, by some years of practice, familiarity with the particular branch of industry to be taught and illustrated in the course to be pursued. They are, therefore, necessarily young men of seventeen or eighteen years of age, with sufficient maturity and discipline to enable them to derive benefit from the brief courses of a few weeks furnished them at the Royal Academy. Then there are courses in gardening, in orcharding, in meadow husbandry, in sheep husbandry, &c. And more recently there has been established a course of three weeks in autumn, (during the summer vacation in the common schools and the farm schools of the kingdom,) for the better instruction of school-teachers in the general principles and practice

of agriculture. The number of those who may be admitted to this course is limited to twenty-five, and only those are entitled to enter who have shown by their personal labors, either on their own or on the school-house grounds, a disposition to promote the advancement of agricultural education.

Again, in addition to these regular courses of instruction, such occasional or extraordinary courses are opened and conducted from time to time as the exigencies of industry or of the civil service of the state seem to require. In all these ways the academy occupies a very wide field, and by its great usefulness to the state has acquired a marked influence, not only in the kingdom of Wurtemberg, but in all the countries of Europe.

The immediate management of the whole institution, in all its branches, as well as of the farm, garden, experimental grounds, and all else connected with it, is intrusted by the government to a director, assisted by a secretary, a treasurer and book-keeper, an overseer for the institute, a farm assistant, a house-master, a postmaster, and a telegraph operator; which last also serves the public at large, the post and telegraph offices for Hohenheim station being in, and in a certain sense a part of, the institution.

The instruction is given by the director and twelve other professors, in charge of the following general departments, to wit: Mathematics, natural science, theory and practice of agriculture, practical forestry, forest economy, state forestry, agricultural technology, political economy, rural architecture, and the draughting of plans.

The instruction in the academy is given by lectures, by demonstrations, by excursions, and in connection with actual practice in the field and forest.

The following are the courses of study in agriculture and in forestry, together with the collateral branches taught:

Agricultural course: General agriculture and plant culture; special plant culture; meadow culture; grape, hop, and tobacco culture; fruit culture; culture of vegetables; breeding of domestic animals in general; horse-breeding; cattle-breeding; sheep-breeding; breeding small animals; silk-worm culture; bee culture; forestry; forest valuation; Wurtemberg forest laws; practical forest business.

This course is supported by scientific instruction in arithmetic and algebra; planeometry; stereometry; trigonometry; practical geometry; mechanics; taxation; book-keeping; physics; general chemistry; analytical chemistry; agricultural chemistry; geognosy; special botany; vegetable physiology; general zoology; special zoology; veterinary science; economical architecture; principles of law; national economy.

Courses in forestry: Encyclopedia of forest science; agricultural encyclopedia for foresters; forest botany; growing woodlands; protection of forests; technology of forests; valuation of forests; Wurtemberg forest laws; forest taxation; practical forest business.

The collateral branches are the same as above enumerated in connection with the agricultural course.

The period of a full course in both the institute and the forestry school is two years; though, if specially prepared for admission by a judicious course of preliminary study, one year may suffice. Each scholastic year embraces two sessions; the first beginning November 1, and continuing to Palm Sunday, the second beginning two weeks after the close of the first and ending October 1. Examinations are held semi-annually, but these are obligatory only upon such forestry pupils as intend to enter the government service. Such as are examined receive a certificate of proficiency or of completion of the studies included in the course of instruction, together with a statement as to diligence and general deportment. Students not examined receive simply a certificate of attendance, specifying the length of time they have spent in the institution. The expenses of the academy for salaries, instruction of every kind, library, buildings, management in general, &c., are about 34,000 florins (of 40 cents each) per annum; the income from tuition fees, some 20,000 florins; the profits of the farm, about 6,000 florins; leaving a deficit of 8,000 to be paid by the government. The school of practical farming and the school of horticulture, being considered institutes solely for public instruction, are entirely supported by the government.

SCHOOLS CONNECTED WITH OTHER INSTITUTIONS.

Of the second class of agricultural schools, those connected with other institutions, especially universities, the number is less, though constantly increasing. The three most highly-approved by Baron Liebig, on whose special recommendation I visited them, are those connected with the ancient universities of Halle, Jena, and Göttingen.

In this connection it is proper to make more particular mention of the agricultural agency known as the experimental station, (*Versuch station,*) which consists of a few acres of land—twelve to twenty—divided into small plats for purely experimental purposes, in the midst of, or in immediate connection with which there is a chemical and physical laboratory, and not unfrequently such accommodations for domestic animals and such general facilities for physiological investigation as are suggested by the problems of breeding, ordinary feeding, fattening, &c.

Stations of this sort have sprung up since the discovery of the applicability of chemistry to agriculture as a means of settling the formerly troublesome questions of natural fertility, manuring, and rotation of crops, and so on; and if I am not much mistaken, as now established and conducted, were suggested by Baron Liebig. At all events, he attaches great importance to them and has been largely instrumental in their establishment in nearly if not all the German States. It is easy to see that, in the present undeveloped condition of the science of agriculture, such agencies are a primary necessity; and, judging from the practical workings and invariable success of those I have visited in the different continental states, they are destined not only to go hand in hand with

the agricultural schools, but to be established in many cases independently, and where it is neither practicable nor needful to establish a school. In most cases in Europe experimental stations are established and maintained at the expense of the government, as a necessary means of determining the principles which underlie the most successful practice, and as being therefore essential to the industrial development of the state. It is unnecessary to remark that their multiplication in the Old World, while it must tend very greatly to advance the science and art of agriculture throughout the world, by the discovery of principles of universal application, they cannot settle all the questions that must arise, since many of them are limited in scope by circumstances of locality, and can only be determined on the very spot where they arise. They must be established in every country, therefore, and in many parts of each country, as the pioneers of the profession of agriculture that is to be.

BAVARIA.

The first Bavarian school of agriculture was founded at Schleissheim, on an estate of nearly seven thousand acres, in 1822, but has recently been removed to the old estate of Weyhenstephen, near Freising, some twenty miles north of Munich. It occupies a farm of several hundred acres, well stocked with domestic animals, and appears to be in a healthy condition. The course of instruction embraces two years, and is given by six regular professors with as many assistants; number of pupils usually about fifty.

Besides this Royal Central School at Freising, Bavaria reckons eleven other agricultural schools of lesser rank, all of them liberally supported or aided by the state.

IRELAND.

The beginning of agricultural schools in Ireland was at Templemoyle, near Londonderry, at which place the Northwest-of-Ireland Society established a farmers' school in 1827. There are nearly two hundred acres of land connected with the institution, which still continues to flourish. Since that date, besides the model farm and school at Glasnevin, near Dublin, founded in 1838, and designed for a sort of normal agricultural school, the number of schools of lower grade have multiplied until the number now exceeds seventy.

RUSSIA.

Russia early manifested an interest in the general movement for the establishment of schools of agriculture and forestry, and as early as 1824 founded an intermediate school for such instruction, including also engineering as a subordinate branch, at Marjino. This was followed, four years after, by the establishment of a school for instruction in bee culture—the pioneer of a great number of agricultural and industrial schools, devoted each to some individual branch. But the first Russian

school of superior grade was established at Gorky in the government of Moheelev, in 1833. Its object was to form a nursery of professors for the secondary schools of agriculture, of which there were five already in operation, and others in contemplation, sufficient in number to supply all the subordinate governments of that great empire. It was required of applicants for admission that they should have finished their studies in the *gymnases* (colleges) or in agronomic schools of second rank. Since 1863 this school has been transferred to Lesnoy, in the vicinity of St. Petersburg, where, in the year 1867, it was my pleasure to find it in a most flourishing condition. The course of study occupies three years, and embraces, in general terms, chemistry, physics, mineralogy, botany, zoology, mathematics, geology, mechanics, architecture, technology, zootechny, agricultural theory and practice, forestry, rural economy, political economy, and statistics.

The number of professors is 15; of pupils, 90. By reason of an annual appropriation from the imperial treasury of $50,000, tuition is free. Pupils, nevertheless, pay about $24 per annum for the privilege of the chemical, physical, technological, and botanical laboratories.

The experimental grounds include about seventy-five acres, upon which, during the summer semester much time is devoted to the practical field-studies. From June to September the professors also frequently lead their pupils in botanical, mineralogical, and agricultural excursions.

In 1836 was founded the Imperial Agricultural Institute at Gorigoritz, embracing primary, intermediate, and superior departments. Then rapidly followed the creation of numerous establishments for the production of silk, with departments for instruction in the art; schools of horticulture; farm schools; model farms; special schools for the culture of flax, &c.; all distributed with a liberality almost profuse over the vast territory of the empire according to the nature of the soil and climate and the habits and needs of the people. Then in quick succession were established the great agricultural museum at St. Petersburg, with numerous lesser ones of various grades in diverse portions of the empire; a large number of secondary schools of agriculture located at Moscow, Kasan, at Gorky, at Saratov, at Kharkov, and other points; also many schools of horticulture, chief among which are those at Orel, at Ouman, at Kieff, and at Voronezh; schools of vine culture at Magalatch, in Central Russia, and at Kischineff, in Bessarabia; schools of agriculture and horticulture in Caucasia; and last of all, and chief among all, the great Academy of Agriculture and Forestry, founded by the minister of domains, at Petrovskoi, near Moscow, in 1865.

The secondary schools of agriculture above referred to are among the most flourishing of their kind in Europe. Each school is provided with chemical laboratories, physical and agricultural cabinets, and with a model farm well stocked with implements and domestic animals. The course of instruction occupies five years, and includes religion and Christian morals, arithmetic, natural sciences, the Russian language,

geography, history, and design, together with practical exercises in the laboratories and on the farm. They are attended by an average of one hundred to one hundred and fifty pupils, and each school is endowed with a regular income from the state of $8,000 to $12,000, according to the necessities of the locality.

The schools of Caucasia, established since the conquest by the Russian government and the Agricultural Society of Caucasia jointly, are remarkable for their liberality, which in some cases goes quite beyond gratuitous instruction, and even secures to the pupils small incomes sufficient to meet all expenses of their education.

Thus, at the farm school of Latschino, near Tiflis, upon the property of Baron Nicolaï, the instruction given in geometry, surveying, and the applications of science to horticulture, arboriculture, bee-culture, vine-culture, silk-culture, the breeding and rearing of domestic animals, and to general agriculture is not alone free; but boarding, lodging, clothing, books, &c., are also gratuitous, and the pupils, (of whom the number is limited to twenty-two,) moreover, each receive $40 for the first year, $64 for the second, $72 the third, and $80 for the fourth and last year, for other important uses. The Horticultural School of Tiflis, the School of Viticulture at Katchéti, the School of Silk-culture at Stavropol, the Horticultural School at Rohtaïs, and the Agricultural School at Wadikarkas are also entirely free.

The Russian agricultural schools of academic grade are entitled to high rank among the best in Europe. The Agricultural and Forestry Academy of Petrovskoi, near Moscow, to which incidental reference has already been made, as being at once the highest and the most recently established, (in 1865,) is worthy of more special notice. This institution embraces two faculties, one of agriculture and the other of forestry, the duration of the course of study in each being fixed at three years. Any one, whatever his condition in life, on making advance payment of $10 per *semester* is admitted to the instruction furnished. Extensive buildings have been constructed for the accommodation of pupils who desire to live on the premises; the price of a furnished chamber being $3 a month. A large restaurant, in which the dietary regulations are determined by the administration of the school, provides food for all, at fixed and moderate prices.

The courses of study, conducted by eighteen able professors, embrace instruction in the following general departments, to wit: agriculture, zootechny, veterinary science and art, rural constructions, civil engineering, sylviculture, agricultural and forest technology, and rural and political economy.

Auxiliaries, including a valuable special library, an agricultural museum, a cabinet of physical technology, collections of models of apparatus and agricultural and forestal machines, zoological, botanical, and mineralogical cabinets, dendrological collections of much interest, an immense chemical laboratory, and a large farm, are provided with a liberality worthy of the great empire.

The farm comprises about twelve hundred acres, of which between eight and nine hundred is arable land and the remainder forest, and is already provided with a nursery, fruit, kitchen, and botanical gardens, with a dairy, wagon-houses, and well-equipped establishments for implements of every kind, and with well-arranged barns for grain and domestic animals.

The academy confers two degrees, that of bachelor and that of master. In order to secure the first the student must pass an examination in all the sciences taught, whether they relate to agriculture or to forestry, and present to the council a scientific memoir upon a given subject. To obtain the degree of master, the applicant must present his diploma of bachelor, undergo a second examination, and publicly defend a thesis on some relevant subject.

The number of students attending this great institution in 1866 was four hundred and fifty, of whom eighty-five received, in addition to free tuition, bursaries of some $20 each. But all this magnificent array of forces and material, with a patronage approached by no other institution of like character in the world, does not adequately illustrate the spirit and energy with which the government is pushing forward the noble work of educating the agricultural classes. The present status merely is thus indicated. The purpose and the energy of the government are further and even more forcibly shown by the fact that its annual appropriation to this one great academy at present exceeds the sum of $100,000.

In view of these movements of the Russian empire, but dimly outlined in these pages, to place that so very enterprising power in the front rank of the most progressive nations of the earth, it was fitting that the International Jury of the Exposition should present the testimonial of its high appreciation of the ministers of public instruction of domains, and of agriculture and public works, for their cordial and intelligent concurrence in the furtherance of this great work, and no less fitting that here, in this general survey of industrial education, we accord to Russia the well-earned honor of now standing foremost of the nations in this department.

GREAT BRITAIN.

Great Britain has been surprisingly slow, and, so far as the attempt has been made, rather unsuccessful in the department of agricultural education. In 1849 a school was established at Cirencester, with royal title, and with at first a promise of usefulness. The buildings were ample and substantial; the farm of seven hundred acres, though rather poor, tolerably well adapted to the purpose intended; the course of instruction given by six professors, some of them, as for example Dr. Volcker, eminent in the profession; and the need of such an institution generally recognized among the intelligent agriculturists of the kingdom. Nevertheless, the institution has never flourished in the best sense of that term, and is now half abandoned by even its friends. Whether its

failure to meet the expectation of its originators has been due to the form of its organization, or to that pertinacity of the English aristocracy which, so long as pupils from the middle and lower ranks in life attended the college, held back the sons of the nobility from participating in its benefits, or to the refusal of the government to grant the necessary aid, and the consequent high charges made for instruction, ($175 per annum,) or whether all these circumstances combined to prevent its success, there seems to be difficulty in determining. But the fact is undeniable that the institution languishes, while the few young men ambitious of a knowledge of scientific agriculture are found distributed among the schools of the continent.

Some little instruction is given in agriculture by professors in various institutions of scientific and technical character, but hardly sufficient in amount and importance to demand special attention.

In Scotland professional instruction in agriculture is confined to a single chair in the University of Edinburgh, and to special lectures given in a college at Aberdeen.

BELGIUM.

Belgium claims ten or twelve schools of agriculture, but most of them are either primary, intermediate, or connected adjunctively with communal colleges, and none of them have attained to any eminence.

Baden is credited, in like manner, with six schools of agriculture and forestry. Two of these, the Agricultural School of the Royal Polytechnic School at Carlsruhe being chief, are superior, the others intermediate or inferior.

CENTRAL GERMANY AND OTHER PARTS OF EUROPE.

Several of the duchies of Central Germany, including, especially, Saxe-Weimar, whose agricultural institute of the University of Jena is worthy of special notice, make liberal provision for agricultural education; their schools of different grades numbering in the aggregate not less than thirty.

Of the agricultural schools of other European countries established within more recent years, and in no way specially distinguished, I do not deem it important to speak in detail.

Sweden, Denmark, Italy, Spain, and Portugal have each recognized the importance of such institutions by the establishment of one or more schools, and even Greece and Turkey are now following the example of the other more advanced countries.

AGRICULTURAL EDUCATION IN AMERICA.

Although, by reason of the newness of the country and the cheapness of fertile lands, the establishment of schools designed to afford instruction in the applications of science to agriculture was here longer postponed than in some of the European countries, America has at last

entered into the movement with a spirit and energy that give promise of great results.

As early as 1837 prominent agriculturists began to agitate the question of creating State colleges of agriculture in the different States, either by direct appropriations from the public treasuries, or by joint efforts of people and governments; but nothing was actually accomplished in this direction until 1855, when the legislature of the State of Michigan, in obedience to a provision of the revised constitution expressed in these words, to wit, "The legislature shall encourage the promotion of intellectual, scientific, and agricultural improvement, and shall, as soon as practicable, provide for the establishment of an agricultural school," passed an act for the purchase of land and the endowment and management of the State Agricultural College of Michigan. Immediate steps were taken for the actual establishment of the institution by the purchase of six hundred and seventy-six acres of land near Lansing, the new capital of the State, and by the erection of a college edifice.

The institution was dedicated in 1857, and opened with a corps of seven professors and sixty-one pupils. The legislature this same year supplemented its former provision for endowment and support by a further appropriation of the proceeds of the sale of twenty-two sections of saline lands, (value $55,000,) and the sum of $40,000 per annum for the two ensuing years for necessary improvements and the support of the school. Afterward additional sums were appropriated, and the institution has since been in a steadily improving condition, with an average number of pupils somewhat less than one hundred.

The necessity for actual labor on the farm is a cardinal doctrine of this institution, and regulations for the enforcement of this part of the educational programme have the cordial support of its managers. Instruction is free to all residents of the State, and a moderate compensation for labor is given to those who perform it.

The declared objects are: firstly, to impart a knowledge of science, and its applications to the arts of life; secondly, to afford to its students the privilege of daily manual labor, that neither health nor inclination to labor may be lost, and that the principles taught in the school may be more firmly fixed in the mind; thirdly, to prosecute experiments for the promotion of agriculture; fourthly, to offer the means of a general education to the farming class.

Candidates for admission to the preparatory class must be at least fourteen years of age, and sustain a satisfactory examination in the necessary branches of an elementary education. The preparatory term of study is one year; the collegiate term, four years.

The number of professors is seven; the departments of instruction as follows: mathematics and civil engineering; English literature; general, analytical, and agricultural chemistry; botany; geology and mineralogy; zoology, general and descriptive; entomology; animal and vegetable

physiology; theory and practice of agriculture; theory and practice of horticulture.

The means of illustration independent of the farm, of which three hundred acres are under cultivation, and of the orchard, gardens, &c., include a chemical laboratory; the philosophical and mathematical apparatus usually found in our colleges; collections of animals, minerals, plants, and vegetable productions; and a library.

The degree of bachelor of science is conferred upon students who satisfactorily complete the full course of study, and the degree of master of science upon graduates of three years' standing who give evidence of having been engaged during that period in scientific studies.

Following the example of Michigan, the States of New York, Maryland, and Pennsylvania successively undertook, and early completed, the establishment of similar institutions; Pennsylvania, in particular, making large appropriations of money toward this object.

But it was soon found that the expense of founding and properly endowing valuable colleges of agriculture must necessarily be greater than the individual States—especially the newer States—were able to meet; and so, after due agitation of the question of national aid, running through a period of several years and engaging the earnest efforts of a great number of the agricultural, educational, and public men of the country, on the 2d of July, 1862—while the nation was still in the darkest hour of its struggle with the great rebellion—the act of Congress "donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts" became a law, and thus offered to each of the States not in actual rebellion the means of founding, or at least aid in founding, an institution of this class. Subsequently Congress very wisely so amended the original act as to enable *all* the States and Territories, without regard to their status at any former period, to avail themselves of the benefits it offered. Of the State agricultural colleges in actual operation or in process of establishment at the date of the act of 1862, all, except the State Agricultural College of New York, received from their respective States the national grants. But with those States in which no actual beginning had been made, the disposition of the grants involved so many difficult and perplexing questions that, even at the date of this writing, these questions are still discussed in many of the States, and without prospect of immediate settlement:

1. Shall we establish a separate and independent *agricultural college*, like most of those in the Old World and those of Michigan, Maryland, Pennsylvania, Iowa, Massachusetts, and Kansas, already in operation?

2. Shall we found a separate *industrial university*, like the new one just organized on the basis of the congressional donation in the State of Illinois, or like the Cornell University, also founded upon the national bounty, joined with the princely gifts of the noble friend of education whose name it bears?

3. Shall we establish an independent college by the side of an existing literary college, for the advantage it may confer by the regulated use of libraries, laboratories, collections, and scientific instruction already furnished?

4. Shall we bestow the gift upon some literary college; and, if so, upon what one?

5. Shall we bestow the grant upon some school of science or polytechnic school?

6. Shall we, by reorganization of our State university, create therein a college of agriculture and the mechanic arts in harmony with the other departments?

Such, in general, are the questions that have agitated, now agitate, and seem likely to continue to perplex the several States not provided at the outset with institutions toward which the national grants were drawn by a natural attraction.

And then, again, certain secondary questions, such as the advantage of a model farm connected with the agricultural school wherever established and however organized, and the necessity for manual labor on the farm as a part of the training of the pupils of such school, have in many, if not in all, cases entered into the main problem as a vital part of it, and so increased its complications. If, therefore, with the advantage gained by observation in other countries and a most careful study of the whole subject during a period of some twelve years, any light may be thrown upon these questions, or any of them, this present is certainly a fitting occasion for such an endeavor.

The first question in the above enumeration is practically answered in all cases where a use of the national grant is contemplated by the very terms of the act of Congress making the offer, which expressly provides for the endowment of a college "where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, * * * in order to promote the liberal and practical education of the industrial classes in their several pursuits and professions in life." It being thus demonstrable that no exclusive agricultural college is contemplated by the law, the question of separateness and independence is without force or application.

The second question involves a right conception of the law, but is based chiefly on the idea of separateness and independence, and implies serious objections to association with other institutions. Its answer must be determined by circumstances. If, as in the case of New York, there should be in existence no institution the location and character of which would render its conversion into an institution of the kind demanded easier and better than the foundation of such school in a new place, with munificent endowments otherwise unavailable, then the answer may be in the affirmative; but in the case of any State possessing such suitable institution the answer should be emphatically negative, for the great reason of economy, if for none other. The college of "agriculture and

the mechanic arts" necessarily covers a wide field, needing vast sums of money for its equipment; and scarcely any of our States are at present so rich in means that they can afford to disregard economical considerations. There is but little danger of any school of learning becoming more wealthy than is desirable, while, on the other hand, a stinted, crippled, and sickly institution had better not have existed at all.

The third question implies a recognition of the economy of association, but betrays a fear of too great intimacy—fear largely founded on ancient prejudice of class, which in America, last of all places on earth, should be allowed to take root, but also, to some extent, based on a misapprehension of what are the requisites of an agricultural school. If prejudices do exist between labor and learning, there is no reason why science and letters should not dwell peacefully together under the same generous roof.

If it be objected to the incorporation of the school of agriculture with a literary school, first, that a contiguous model farm would be impracticable in any given case, then I would say a model farm is not only not essential, but, so far as I have been able to determine, not half so valuable as we have been wont to suppose. If means were unlimited, there could be no harm in making a truly model estate, with its numerous establishments all complete—unless it should have the effect to make two-thirds of the pupils blindly, and often absurdly, attempt to follow it in their own future operations—but in most cases it would be better to employ the extra means upon the school itself and on the experimental farm than in vain endeavors to make a pattern capable of fitting every neighborhood in the State. The teaching of principles which are of universal application and the determination of principles by investigation and experiment, these are pre-eminently the mission of the agricultural college.

On this point the experiences of European countries and the opinion of the ablest and most enlightened scientific agriculturists of Europe are in accord; for, although the foreign schools of agriculture most widely distinguished are those which have model farms, it is only that they are the schools first established, and hence more widely known. A large majority of the superior schools established within the past ten years are associated with existing literary or scientific institutions, and have or have not a farm attached, as may be convenient or as may suit the ideas of the originator or patron of the enterprise. They are not deemed at all essential, if indeed, desirable, by those who have made the subject a study and are fully acquainted with the development of agricultural education.

From among the many high authorities on this subject I will merely cite Baron Liebig, who, by his important discoveries and remarkable writings on agricultural chemistry, has contributed more to the progress of agriculture and of agricultural education than any other man, and is so justly deemed the highest authority everywhere. It was on his recom-

mendation that I gave very particular attention to the Agricultural Institute of the University of Halle and other schools of its class—institutions furnished with the very best instruction in the mathematical, physical, and natural sciences, as well as in literature and philosophy, by professors connected with great universities, and simply possessing territory enough for the all-important experimental station, with its laboratories, amphitheaters for practical lectures, experimental grounds, gardens, stock-barns, &c. Under such a plan the out-door labor performed by pupils is no longer mere manual labor, as required on the model farm, but, when performed at all, is an incidental part of scientific investigations, and never irksome to the student. Other labor than what the pupils of enthusiastic teachers will voluntarily and with zest perform is unnecessary, besides being attended with positive embarrassment. If those who teach cannot, by their own example and by the expression of sentiments appreciative of the nobleness of industry and the dignity of intelligent labor, inspire their pupils with just ideas, vain is the arbitrary law that condemns them to the drudgery of routine labor in the fields.

The fourth question, if unqualified, may be safely answered in the negative, as in too many cases the interests of agriculture and the mechanic arts would be confided to men unacquainted with and wholly unappreciative of them. Association between scientific and literary departments, if upon terms of equality and fraternity, is desirable, but not otherwise. The friends of agriculture should make sure, therefore, in effecting consolidation with any institution of different character and aims, first, that the articles of association are wisely drawn; and, what is no less important, that the administration of the new and dual institution be confided to men of large, comprehensive, and impartial views.

But the fifth and sixth questions involve, as it seems to me, the most favorable conditions of success; for if there be in existence, and at a feasible place, a scientific or polytechnic school, the national grant would only give to it desirable expansion and further development; while, if there be a State university, the incorporation with it of the school of agriculture and the mechanic arts, on proper terms and conditions, would accomplish the two-fold object of building up and developing two important institutions of the State at one and the same time.

Influenced by considerations like these, the States of Rhode Island, Connecticut, New Hampshire, Vermont, New Jersey, Wisconsin, Kentucky, and Kansas have conferred the proceeds of the land grants upon scientific schools, departments, or colleges already existing or thus created in State universities or other public institutions sufficiently under their control; while, on the other hand, the States of Maine, Massachusetts, and West Virginia have established distinct and independent agricultural colleges.

New York, with the generous aid of her honored citizen, Ezra Cornell, whose gifts already nearly equal $1,000,000, has created a new university on a broad and generous plan.

Illinois has also created a new industrial university entirely apart from all other institutions of learning.

If to the views above expressed, in relation to the establishment and organization of agricultural schools, I were to add but one other word, it would be an appeal for the setting up of high standards of education for the agriculturist, and a warning against expecting large results from small means.

Two important reasons unite in support of the demand for high standards. First, agriculture as a profession embraces a vast field of study, and cannot be mastered in the brief period of one or two years, even by young men already disciplined and well informed by general study, much less by untutored pupils fresh from the farm and the district school. There is no reason why all who desire knowledge of agriculture should not, by proper gradation of courses of study—by practical courses and limited courses—be accommodated at the college of agriculture. But there are grave reasons why agricultural schools should not degrade the profession they seek to build up and establish in honor, by making the highest course of study they offer a limited one, and thus turning away from their halls and forcing into more honored professions the best endowed and best fitted young men of the country.

I would open the lecture-room to all, and grant certificates of proficiency to such as earn them; but the degrees of bachelor and of master should be held in reserve for such as aspire to professional honors and are willing to take up and go through more protracted and thorough courses of study to obtain them.

As to the requisite pecuniary means, the notion is too prevalent in this country that a few thousand dollars, say fifty to one hundred, should suffice for the establishment and equipment of an agricultural college—amounts less than equal to the annual income of some of the European schools of which account has been given in the preceding pages. The States should be made to understand both the importance and the cost of laboratories, libraries, ample means of illustration, and large corps of able, devoted, and fairly compensated professors; and not until there comes a recognition of all these as absolutely essential to success may we reasonably hope for institutions worthy of our agriculture and of our country.

III.—SCHOOLS OF FORESTRY.

In most European countries the possession of forests is a matter of so great importance that careful measures are taken by the governments to insure their preservation. In some of them—those whose resources are limited to small domains, and whose geographical position is such that they cannot depend on foreign countries for timber, as is the case with many of the interior German States—the necessity for such care in making the most of what they have, is even more imperative than the demand for economical culture of the soil. For, while bread-

stuffs may be imported in exchange for the products of mechanical industry, this is hardly true, to the same extent, of the more bulky products of the forest. And even the more extended and more richly endowed countries find it important to husband their resources as a means of security and increase of power. But the preservation of forests, while they are at the same time necessarily subject to exploitations carried on in the public interest, demands a knowledge of the conditions of the most economical use and reproduction. Not only so, the management of the forest as a part of either a private or public estate, so as to make the most of it as a source of wealth and at the same time keep it in all respects in the best possible condition, requires an amount of scientific and practical knowledge of which we in the New World have but a very imperfect idea. There, the forest is a precious gift, to be jealously watched by the police and cultivated with the best skill that science and patient study can supply; here, it is a barrier in the way of agricultural progress, and hence to be got rid of in the most summary manner—that is the difference.

How long it will be ere we come to look at practical questions with a wisdom that embraces the future in its calculations, I shall not assume to say; but I am certainly safe in asserting that unless we amend our course in forestry matters, as well as in agriculture and many other departments of American industry, the future will have just cause to reproach us with a recklessness and prodigality unparalleled in the history of enlightened nations.

Already, in many portions of our country not so bountifully supplied with forests as others, and especially in our vast prairie regions, the question of fuel and building timber is forcibly pressing the claims of forestry as an art and science upon the attention of individuals and industrial associations; but in very rare, if in any, cases has it gained the attention of the State governments any further than to secure the enactment of laws against trespass.

On the contrary, the European governments have gone far beyond the mere adoption and enforcement of regulations, however wisely planned, against improvidence and unlawful use, in making provision for careful and thorough training of young men for both public and private service in what has thus been made the science and profession of forestry.

In every school of agriculture this science has always been taught; and in many it is treated as the equal of agriculture, both in the degree of its importance and the extent of the courses of instruction provided.

So, likewise, forestry constitutes either a distinct school, or at least an extended course of study, in a great number of the polytechnic schools; reference to the chapter on which is here made for the satisfaction of those who may wish to examine into the nature of the provision for such instruction in schools of that class. As affording the best examples of forestry schools thus incorporated, special attention is called to the schools at Carlsruhe, Zurich, and Tharaudt. The last-

named was, for many years after its establishment, exclusively a school of forestry, the agricultural department having been since added.

As an example of the separate schools of forestry, of which there are several distributed among the states of Germany, Austria, and Russia, I shall more especially notice the one possessed by France.

The *École Impériale Forestière* at Nancy, in the department of Meurthe, has been in existence for several years. It is under the control of the minister of finance, and has for its object the preparation of young men for the service of the administration of the government forests.

The government regulations require of the candidate for admission presentation of satisfactory evidence that the applicant is of French nativity or has been naturalized; that he is between the ages of eighteen and twenty-two years; that he is possessed of a strong and healthy constitution; that he has graduated as bachelor of science, or has completed a course of study in the classical section of a lyceum as far as to and including rhetoric; together with a legal obligation to pay the sum of 1,500 francs for board, besides the expense of his wardrobe during the two years of attendance upon the school; and an annuity of 600 francs from the conclusion of his studies up to the moment of being called into the public service. Having given satisfaction on these several points to the director-general of the administration of forests, the applicant then receives authority from that official to present himself at the competitive examinations, which are both written and oral.

The oral examinations bear upon arithmetic, algebra, geometry, descriptive geometry, trigonometry, physics, chemistry, cosmography, mechanics, botany, history, geography, and the German language. Conformably to official programmes candidates must also present to the examiners twelve sheets of design of such nature as may be required.

The written examinations are six in number, including mathematics, especially trigonometry and logarithmic calculations, French narration, dictation in French, drawing, linear design, and broad color-washing.

On arriving at the school the successful candidate must undergo examination by a surgeon, to make sure that he possesses no infirmity or tendency to disease that would interfere with the duties of forestry.

The course of study occupies two years; the subjects embraced being, in general terms, as follows: surveying, topography, geology, agricultural chemistry, drawing, design of plans, general and agricultural botany, excursions into the forests for practical observation, valuation of timber, cosmography, petrography, forestry, entomology, construction of roads and hydraulic works, culture of forests, exploitations of forests and the direction of them, forestry statistics, general management of forests, knowledge of the forests belonging to the empire.

On completing the course of study, and passing the final examination, the student is graduated with the title of keeper-general of forests, and is entitled to enter the service as soon as a vacancy occurs.

This school is also open to day pupils complying with the regulations as to examination, &c.

It may not be necessary for the United States to have independent schools of forestry, like the *École Impériale*, but it is unquestionably important that forestry should receive more attention from both State and national governments, and that such provision should be made for instruction therein by all our colleges of agriculture and the mechanic arts as shall insure a better future appreciation of the economical interests it represents.

IV.—VETERINARY SCHOOLS.

Veterinary science is not only now considered an essential part of the instruction in every well-appointed agricultural school, but numerous independent schools, liberally endowed and fully equipped, have been established in various parts of the world. Those of which I have gained personal knowledge by inspection, and which are generally regarded as first in importance, are located at Alfort, Lyons, Toulouse, London, Turin, Ferrara, Bologna, Vienna, and Berlin. Of these, the French schools at Lyons and at Alfort are the best organized and probably the most completely furnished. The Lyons school was established in 1762, and has long enjoyed a world-wide reputation. But, of late years, the institution at Alfort has attained a rather higher rank, and in this report will be taken as the representative of its class. Both of these schools, together with a third located at Toulouse, which I did not visit, are maintained at the expense of the government. They are under the control of the minister of agriculture, of commerce, and of public works, and have for their object the education of young men of suitable qualifications in the science and art of veterinary medicine and surgery for the military service and for private practice.

It is necessary that the candidate for admission to either of the French schools should be not less than seventeen years of age nor more than twenty-five, and conform to the usual requirements as to location, his having been vaccinated, &c. Such as have been authorized by the minister of agriculture to present themselves at the institution, before admission as pupils, are required to pass examination in the French language, arithmetic, geometry, geography, and history. They board within the institution, at a cost of 450 francs per annum. These institutions are provided with all needful buildings for the accommodation of pupils and professors, a large number of hospitals for domestic animals, libraries, and extensive collections in natural history and pathological anatomy.

The faculties each consist of a director, who, beside having general direction of the institution and supervising its affairs, gives instruction in some one of the departments, and five or six professors, with a number of assistants. Some of the professors have European reputations

and are doing much by their investigations to advance veterinary science.

The term of study is four years and embraces courses of instruction in general and animal chemistry; veterinary zoology; anatomy, and physiology; botany and materia medica; the theory and practice of veterinary medicine and surgery; practical exercises in the hospitals of the institution, and in the art of horse-shoeing; history and literature of veterinary medicine.

The Italian schools, located at Turin and Milan, and founded shortly after the French schools, are now in a flourishing condition, and under the new regime of Victor Emanuel, bid fair to become rivals of those of France. They are sustained by the government, and are just now being improved by the addition of new constructions, and the enlargement of old ones. The plan of organization and the system of management are quite like those of the French schools. They are under the control of the minister of public instruction, however, instead of the minister of agriculture, as in France, the general management being intrusted to a director. Their immediate economical administration devolves upon a secretary, (*segretario economico*,) by whom the director is wisely relieved of much of the care often imposed upon such officers.

The instruction is theoretical and practical, and occupies a period of four years.

The subjects taught, with the number of lessons per half-year given in some of the most important studies, are as follows:

First year, winter term: External conformation of animals, 20 lessons; anatomy and physiology, 69 lessons; theoretical horse-shoeing, 16 lessons; anatomical dissections.

First year, summer term: Botany, 31 lessons; anatomy and physiology, 76 lessons; practical horse-shoeing; zoology, 30 lessons; dissections.

Second year, winter term: Breeds of animals, 22 lessons; general chemistry, 16 lessons; hygiene, 45 lessons; anatomy and physiology, 69 lessons; theoretical shoeing, 16 lessons; surgical clinics; practical shoeing; dissections.

Second year, summer term: Medical clinics; general chemistry, 46 lessons; surgical clinics; anatomy and physiology, 76 lessons; dissections; hygienic and botanical excursions.

Third year, winter term: Pharmacy, 53 lessons; medical pathology, 18 lessons; medical clinics; surgical pathology, 48 lessons; surgical clinics; operative surgery, once a week, three hours.

Third year, summer term: Medical pathology, 66 lessons; medical clinics; surgical pathology, 45 lessons; surgical clinics; materia medica, 52 lessons; veterinary history, 10 lessons; surgical pathology, 19 lessons; surgical visits; operative surgery, once a week, three hours; botanical excursions.

Fourth year, winter term: Medical pathology, 18 lessons; medical

clinics; surgical pathology, 48 lessons; surgical clinics; operative surgery, once a week, three hours.

Fourth year, summer term: Medical pathology, 66 lessons; medical clinics; surgical pathology, 64 lessons; surgical clinics; surgical visits; operative surgery.

The medical clinics always occupy one hour a day; the surgical, two hours.

The average number of horses treated in the hospital being six hundred per annum, and the total number treated in the hospital and in the neighborhood being twelve hundred per annum, it will appear that excellent facilities are furnished to pupils for acquiring a knowledge of both medical and surgical practice.

Most of the more recently established schools of veterinary science in European countries are founded in connection with the universities, those of Ferrara, Bologna, and Berlin, in the list above given, being of this class. Inasmuch as the whole groundwork of principles is essentially the same in general medicine and in veterinary science, and since the universities embracing medical faculties—as nearly all do—necessarily teach those principles, and moreover present, in their chemical and physiological laboratories, museums of comparative anatomy, and collections in materia medica, extraordinary facilities for gaining a knowledge of this special science, it will not be surprising if veterinary schools spring up by the side of schools of general medicine in all countries.

Thus far, Italy has taken the lead in this important movement, having, within recent years, in addition to those I visited at Bologna and Ferrara, established others in connection with the university at Naples and with the free universities of Urbino and Perugia.

The course of instruction in *corso di veterinaria* of the Italian university embraces scientific lectures and demonstrations, with clinical examinations and practical medicine and surgery in the veterinary hospital, always a part of the institution. By attendance upon the lectures given in the medical department of the university, the student has the full benefit of the instruction of an able corps of sixteen to twenty professors. The studies taught are the following, to wit: chemistry, inorganic and pharmaceutical; botany; materia medica; pharmacy; anatomy of man; general comparative anatomy; anatomy of the domestic animals; human and veterinary physiology; general pathology; veterinary pathology; surgical pathology; veterinary medicine; veterinary surgery; veterinary obstetrics; veterinary hygiene; conformation of different breeds of domestic animals; pasturage; stall feeding; construction of stables; rural economy; veterinary police; veterinary jurisprudence; and horseshoeing. The clinics are, of course, both medical and surgical.

VETERINARY COLLEGE OF PRUSSIA.

The Royal Veterinary College of Prussia was founded by the government in 1796 as a separate school, but has been just recently attached

to the university. It is pleasantly located in the suburbs of Berlin, and besides the ancient buildings of different kinds has, of late, been favored with the addition of neatly constructed hospitals, anatomical and pathological museum, laboratories, &c., erected in the adjoining park. The college is under the immediate management of a director, and the instruction is given by six regular professors, with assistants; the students also having access to certain lectures in the university.

The following programme of studies shows at once the branches taught and the order of occurrence:

First year, winter semester: Anatomy; elements of physics and chemistry; horse-shoeing; smithing; zootomy.

First year, summer semester: Natural history; botany; physiology; materia medica; review of horse-shoeing; smithing; lessons in the apothecary shop; instructions in smithing.

Second year, winter semester: Surgery, (part 1;) chemistry; special pathology and therapeutics, (part 1;) general pathology and therapeutics; review of materia medica; zootomy, (part of semester;) pharmacy; smithing.

Second year, summer semester: Surgery, (part 2;) rearing domestic animals; physics; special pathology and therapeutics; review of general pathology and therapeutics; pharmacy and smithing.

Third year, winter semester: Anatomy; pathological anatomy; cattle, sheep, and swine breeding; encyclopedia and history of veterinary science; review of special pathology and therapeutics, (part 1;) practical operations; clinics.

Third year, summer semester: Care and management of a stud; exterior of domestic animals; veterinary jurisprudence; review of special pathology and therapeutics; clinics in the institution; perambulatory clinics.

Fourth year, winter semester: Cyclopedia and history of veterinary science; college and perambulatory clinics.

The total annual expenses of the college are about $24,000. The students not sent to the institution with a view to army service pay $12 each per semester as tuition. The number of students in 1867 was 160; of whom 40 were civil and 120 military pupils.

SPAIN.

Spain has a high veterinary school at Madrid, with branches at Saragossa and Cordova, and several others exist in various parts of Europe.

UNITED STATES.

Recent attempts have been made in the United States to establish veterinary schools in two or three of the large cities; but as yet none of them, so far as I have information, can be said to have an established and recognized existence. Veterinary science will doubtless be taught in all the State colleges of agriculture and the mechanic arts, and so

measurably supply this lack; but there certainly ought to be at least one well-equipped school of this kind in the whole country.

V.—SCHOOLS OF MINES.

The mineral resources of most countries constitute so large a part of their available wealth, and are withal commanded with so much more difficulty than any other form of material wealth, that they demand alike the aid of science and the best exercise of inventive genius. It is, therefore, not surprising that the art of mining was one of the first during the latter half of the last century to avail itself of the aid of the sciences of chemistry, mineralogy, and geology. Previous to that time experience was the only guide in the search for, and extraction of, the hidden treasures of the earth, and hence incalculable amounts were spent in every mineral-producing country in fruitless endeavors to obtain them under impossible conditions.

Like that of agriculture, the art of mining is complex, including many subordinates, and borrowing extensively from other arts, and deriving aid from several branches of science. It is one thing to determine the position and extent of a deposit, and another to penetrate the rocky crust of the earth for its extraction; to expel the noxious gases that would destroy the life of the miner; to conquer the floods of water that often deluge the mine; to raise the precious mineral from incredible depths; and, when at last brought to the surface, to smelt, refine, and prepare it for the use of man.

AUSTRIAN MINING SCHOOL AT CHEMNITZ.

The first one of the important special schools of mines now found in Austria, Saxony, Prussia, France, Great Britain, Russia, and perhaps in some of the other European states, was established by Maria Theresa, at Chemnitz, Hungary, in the year 1760. Remarkable for the great number, variety, and value of its mines of gold, silver, copper, lead, iron, sulphur, and arsenic, this locality had for centuries held a leading position among the mining districts of Europe, and was the most natural place for beginning the cultivation of a science of mining.

This school has thus, for more than a hundred years, continued to shed its light upon the dark and difficult way of the miner, and still holds an honored place among the most useful institutions of its kind in the world. It is liberally supported by the government of Austria, and annually numbers over two hundred students.

MINING ACADEMY, SAXONY.

The Saxon Academy of Mines, founded in 1766, was also established in the midst of important silver and other mines. By reason of having taught, and then for a long time been conducted by, the illustrious Werner, first geologist of his time, it has even gained a higher distinction

than the Hungarian school. At the present time it is under the general direction of the minister of finance; its supervision being intrusted to the directory of mines. Its primary object is the education of young men for the corps of mines of the state; but other young men, residents of Saxony and foreigners, also attend. Indeed, nearly every country of Europe, as well as the United States and Brazil, has pupils there. The requisites for admission are an age between sixteen and twenty-three years, good moral character, sound health, ability to write the German language correctly, acquaintance with Latin sufficient for the ready translation of easy authors, and a good knowledge of geography, history, arithmetic, elements of geometry, and drawing.

Candidates are thoroughly examined, and such as intend entering the corps of mines—to whom the instruction and support are free—must furnish satisfactory guarantees that in case they eventually enter another profession they will return to the institution the expenses of their education therein. Besides free tuition, &c., these candidates receive pay from the government amounting to from $10 to $30 per annum—the amount increasing from the first to the end of the third year—as further encouragement. During the fourth and last year of study in the academy, the candidate receives simply compensation for service in the mines.

Pupils, other than candidates, pay a trifling tuition fee, and are not held to the full four years' course of study; the classification being so arranged as to meet the wants of those who are to engage in different branches of the mining business. For the sake of economy of time and instruction, the studies are so ordered that during the period of the first or general course they may be pursued by all in common. After that the candidates take up the more strictly professional studies, pursuing these partly in common until the beginning of the fourth year, when the paths of the miner and the metallurgist entirely separate, so far as the practical branches are concerned. If any desire to qualify themselves to the utmost for the corps, they must master both departments, mining and metallurgy.

The general course embraces pure and applied mathematics; mechanics and mining machinery; general, analytical, and technical chemistry; physics; mineralogy; geology; crystallography; drawing, general and topographical; shadows and perspective; drawing of mining implements, machines, and mining-constructions; metallurgy; mining as an art; civil engineering; mining jurisprudence; correspondence; and the French language.

The professional course is as follows:

First year: Mathematics, physics, geology, general and topographical drawing, French language, practical operations in the mines and at the furnaces, under the direction of foremen competent to instruct.

Second year: Higher mathematics, general chemistry, mineralogy, practical exercises in chemical and mineralogical laboratories, crystal-

lography, drawing, civil engineering, the art of mining, practical mining, and geological excursions.

Third year: Applied mathematics, analytical chemistry, technical chemistry, metallurgy, the art of mining, practical mining, geology, with practical exercises.

Fourth year: Machinery of mines, analytical and technical chemistry, theory and practice of mining, practical exercises in mining and metallurgy, practical exercises in general geology and paleontology.

The instruction is given by 13 professors, with the aid of valuable auxiliaries, including the collection of minerals left by Werner, a general geological and mineralogical cabinet, a chemical and physical laboratory, a large and valuable collection of models of mining implements, machines, and constructions, and a library of some 20,000 volumes. When I visited the school (June, 1867) there were some 100 students reported in attendance.

PRUSSIAN MINING SCHOOLS.

The Prussian schools are also in a like flourishing condition. The most important of them are located at Clausthal, in Hanover, and at Berlin. The one at Clausthal has a government mint connected with it for assaying and coining the precious metals produced.

SWEDEN.

Sweden has two mining schools, one at Filipstad, and one at Falun. The first named is an elementary school, controlled and directed by the mining association. Pupils—of whom the number in 1867 was 20—pay an admission fee of 4 rixdollars, and 50 rixdollars for tuition. The branches taught are theoretical and practical geometry, plane trigonometry, physics, mechanics, linear drawing, leveling, chemistry, geology, mineralogy, and metallurgy. The pupils are often taken to neighboring mines, furnaces, and other works for practical instruction.

The school at Falun is about being incorporated with the Royal Polytechnic School at Stockholm. It is supported, in part, by the mining association, and partly by government, which at present annually appropriates 9,700 rixdollars to that object.

In Norway instruction in mining and mining engineering is given at the university; besides which there is an elementary school like that in Sweden above referred to.

RUSSIA.

The Imperial School of Mines at St. Petersburg is one of the finest theoretical schools of the kind in Europe. I say theoretical, because, unlike those above noticed, it is not located in a mining district. It is amply provided with laboratories for metallurgical operations, however, besides having a very large and rich collection of the minerals of Russia, collections of models, &c., and, underneath the magnificent edifice it

occupies, a counterfeit mine of considerable extent and great interest. The course of instruction is ample and thorough, occupying eight years, and being given by 36 professors to regular classes, numbering 250 pupils.

Besides this noble central institution, Russia has ten others of secondary grade, and nearly a hundred primary mining schools in the various mining districts of the empire. The corps of miners is a branch of the public service, and includes many of the ablest and most scientific men of the country.

FRANCE.

The *École Impériale des Mines* of France, located at Paris, is likewise an institution of great importance and of high reputation. It is designed to prepare graduates from the Imperial Polytechnic School for the public service. Pupils not from the polytechnic school are also admitted if possessed of high qualifications; but these are only fitted to direct practical mining exploitations and metallurgical establishments and cannot enter the service of the state. The term of study is three years; tuition free.

Applicants for admission, not graduates of the polytechnic school, must show that they have attained the age of seventeen years, and were not more than twenty-three on the first of January preceding application; that they are French, either by birth or naturalization; that they are of good moral character, &c.; and must satisfy the examiners that they are proficients in infinitesimal analysis, mechanics, descriptive geometry and its applications, physics—so far as it relates to gas and to optical instruments—general chemistry, and geometric design. The ability to write a fair, legible hand and correct orthography are also demanded. The examinations are conducted, in the several departments where this class of pupils reside, by engineers of mines designated by the minister of agriculture, commerce, and public works, under whom the school is placed. Polytechnic pupils and licentiates of mathematical science are not examined for admission. There is a preparatory course, of one year, for the benefit of such applicants as, being otherwise desirable pupils, are not quite able to pass the requisite examination.

There are also two other schools for instruction in mining in France—a school of miners at St. Etienne, designed to form directors of mining and of metallurgic operations and superintendents of mines, and in which the term of study is also three years; and a school of master miners, situated at Alais, whose object is to form foremen, who shall possess at the same time sufficient practical knowledge to enable them to supervise the labor of workmen, and theoretical knowledge enough to execute the orders of a director of exploitations. In this school of master miners the term of study is two years. A number of bursaries, created by the state, are conferred in preference on miners or the sons of miners.

GREAT BRITAIN.

Great Britain, although the leading mineral-producing country of the world, has been neglectful in the matter of providing schools for the instruction of its miners in the principles of the art. As early as 1839 the distinguished Sir Henry de la Bêche, then Secretary of the Geological Society, and afterward Director General of the Geological Survey of the United Kingdom, opened a course of lectures on the science and art of mining, which at last, in 1851, became the government School of Mines, of which the scientific men of the kingdom are now justly proud. Being associated in the same building with the Museum of Practical Geology, the Mining Record Office, and offices of the Director General of the Survey of the kingdom, it possesses extraordinary advantages for giving theoretical instruction.

The corps of instructors includes able lecturers on geology, mineralogy, chemistry, paleontology, physics, mechanics, natural history, mining and metallurgy, topographical and mechanical drawing. Besides the lectures, there are frequent examinations, as well as regular practice by such students as intend to devote themselves to the profession, in the chemical and metallurgic laboratories. Many of the lecturers are leading men in their respective departments; and not a few of the pupils, who have gone from this school into practical service, have won for it and for themselves much credit by their success.

UNITED STATES.

In the United States we have as yet no separate school of mines; but several schools and courses in mining have been lately established in connection with existing institutions, as, for example, with the Massachusetts Institute of Technology; the Scientific School of Harvard University; the Sheffield Scientific School of Yale College; Columbia College at New York; the Rensselaer Polytechnic School at Troy, New York; with the Polytechnic School of the State of Pennsylvania, located at Philadelphia; and with the University of Michigan. The State of California is at present laying the foundation for a school of mines, as a leading branch of its Agricultural, Mining, and Mechanical Arts College, endowed in part with the national land grant of 1862.

The term of study in the several schools of mines now in operation varies from two years (which is the period in most of the polytechnic schools) to three and four years, the term for most of those connected with the higher colleges and universities. The minimum age at which pupils may be admitted is sixteen years; no maximum age being fixed. The fees for tuition and use of laboratories range between \$125 to \$200 per annum. The collegiate year, in most cases, begins about the 1st of October, and ends with the 1st of June or the 1st of July.

The educational fitness required may be said, in general terms, to be a fair acquaintance with the branches taught in the public high schools of the country, exclusive of the ancient languages.

THE SCHOOL OF MINES OF COLUMBIA COLLEGE, NEW YORK.

This school of mines was established in 1864, for the purpose of furnishing to students the means of acquiring a thorough knowledge of those branches of science which form the basis of the industrial pursuits that are to play the most important part in the development of the resources of our country.

The system of instruction followed in the school includes four parallel courses of study, viz:

I. Mining engineering.
II. Metallurgy.
III. Geology and natural history.
IV. Analytical and applied chemistry.

A fifth course, in civil engineering, will be introduced at the beginning of the next academic year, in October.

The school is provided with fine mineralogical and geological collections; physical, mechanical, engineering, and mathematical instruments and models; chemical and physical apparatus; chemical and metallurgical laboratories; and a scientific library and reading-room.

These are all sustained by liberal annual appropriations, which enable the professors to rapidly increase these important means of illustration and practical instruction.

Communication has been established with kindred institutions in Europe, and very valuable additions to the cabinets and library have already been received from France, Germany, and Russia.

The success of the school of mines has surpassed the most sanguine expectations of its projectors. The average number of pupils for the past three years has been about one hundred, of whom about one-third are college graduates.

Although the school has been in existence but five years, it has already sent forth thirty-four graduates, most of whom have been already appointed to responsible positions as mining engineers, metallurgists, geologists, chemists, or professors.

The officers of the school, most of whom were educated in Europe, are satisfied that the school now offers to American students every facility necessary so enable them to prepare themselves for any of the professions which involve the practical application of the branches of science therein taught; and that it is no longer necessary for young men to visit Europe to study applied science; in fact, that they can be better fitted here *for this field of labor*, which is characterized by peculiar conditions of labor, transportation, &c.

The school is under the presidency of F. A. P. Barnard, S.T.D., LL.D., and has nine professors, and the same number of instructors and assistants. The list of professors includes the names of gentlemen highly distinguished in science for their original investigations and contributions in their several departments.

THE PLAN OF INSTRUCTION.—The plan of instruction pursued in the

school includes lectures and recitations in the several departments of study; practice in the chemical and metallurgical laboratories; projects, estimates, and drawings for the establishment of mines, and for the construction of metallurgical and chemical works; reports on mines, industrial establishments, and field geology.

The course of instruction occupies three years. Those who complete it receive the degree of engineer of mines or bachelor of philosophy. There is a post-graduate course of one year for the degree of doctor of philosophy.

For candidates not qualified to enter the first year, a preparatory year has been added.

The year is divided into two sessions. The first commences on the first Monday in October; the second on the first Thursday in February. The lectures close on the first Friday in June. The annual examinations are then held on all the studies of the year.

The method of instruction is such that every pupil may acquire a thorough theoretical knowledge of each branch, of which he is required to give evidence at the close of the session by written and oral examinations. At the commencement of the following year he is required to show, from reports of works visited, that he not only understands the theoretical principles of the subjects treated, but also their practical application.

SYNOPSIS OF STUDIES, FIRST YEAR.—*First session:* Analytical geometry,[1] descriptive geometry, inorganic chemistry,[2] qualitative analysis, crystallography, blowpipe analysis, botany, French, German, drawing.

Second session: Calculus,[1] descriptive geometry, organic chemistry,[2] qualitative analysis, blowpipe analysis, zoology, French, German, stoichiometry, drawing.

Memoir and journal of travel during the summer vacation.

SECOND YEAR.—I. For mining engineering students: Mechanics, mining engineering, quantitative analysis, metallurgy, geology, mineralogy, mathematical physics, drawing. II. For students of metallurgy: Quantitative analysis, metallurgy, geology, mineralogy, drawing. III. For students in geology and natural history: Quantitative analysis, metallurgy, geology, mineralogy, drawing. IV. For students in analytical and applied chemistry: Quantitative analysis, metallurgy, geology, applied chemistry, drawing.

Memoir and journal of travel during the summer vacation.

THIRD YEAR.—I. For students of mining engineering: Mining engineering, assaying, economic geology, metallurgy, quantitative analysis, drawing, project. II. For students in metallurgy: Assaying, economic geology, metallurgy, quantitative analysis, lithology, drawing, project. III. For students of geology and natural history: Economic geology, lithology, paleontology, drawing, dissertation. IV. For students of

[1] Optional for students of the geological and chemical courses.

[2] Optional for students of the mining engineering course.

analytical and applied chemistry: Assaying, economic geology, metallurgy, quantitative analysis, applied chemistry, drawing, dissertation.

POST-GRADUATE COURSE, PREPARATORY YEAR.—*First session:* Geometry, physics, chemistry, French, German, drawing.

Second session: Algebra and trigonometry, physics, chemistry, French, German, drawing.

MATHEMATICS.—The course in mathematics in the preparatory year embraces algebra, so far as to include the general theory of equations; geometry, plane, volumetric, and spherical; trigonometry, plane, analytical, and spherical; mensuration of surfaces and of volumes. In the first year, analytical geometry of two and three dimensions; differential and integral calculus; differentials of algebraic and transcendental functions; successive differentials; maxima and minima; transcendental curves; curvature; integration of regularly formed differentials; integration by series; integration of fractions; special methods of integration; rectification of curves; quadrature of surfaces; cubature of volumes.

PHYSICS.—The students of the preparatory year are occupied during the first term with the subject of heat, including the steam-engine, while the second term is employed in the study of voltaic electricity, magnetism, and electro-magnetism. These courses of lectures are fully illustrated by appropriate experiments; the instruction is conveyed by lectures and recitations, practical problems being occasionally proposed for solution.

During the second year courses of lectures are delivered on the laws of electro-dynamics, on the mechanical theory of heat, on mathematical optics, and on the undulatory theory of light. Portions of these courses are accompanied by experimental demonstrations.

The cabinet of physical apparatus will rank with the best on this continent, and extensive additions are made to it each year.

MECHANICS.—This subject is taught during the second year. The course of instruction embraces the following subjects: Composition and equilibrium of forces; center of gravity and stability; elements of machinery; hurtful resistances; rectilinear and periodic motion; moment of inertia; curvilinear and rotary motion; mechanics of liquids; mechanics of gases and vapors; hydraulic and pneumatic machines.

DRAWING AND DESCRIPTIVE GEOMETRY.—During the first session of the preparatory year the student is taught to execute topographical maps. He is first instructed in the use of the pen to delineate lines of level, shaded with lines of declivity, and completed with the conventional signs of different features, such as water, forests, marshes, cultivated ground, outcrops of veins, &c.; subsequently he is taught to represent the same in shading of india ink or sepia, with the application of the conventional signs and colors used by our government and civil engineers. During the second session the course of instruction includes sketching in pencil from plane models and from nature; afterward colored sketches or landscape drawing in water colors.

During the first year descriptive geometry is taught. The course of instruction includes the study of Davies's treatise on this subject, with lectures and blackboard exercises illustrated by Olivier, and other models, showing the more difficult problems of intersections and the generation of warped surfaces.

The instruction in drawing includes the use of mathematical instruments in constructing on paper the problems of descriptive geometry.

During the second session graphics are taught, including the study of Davies's Shades and Shadows, and Perspective; and Mahan's Stone Cutting, with explanatory lectures; the exhibition of models; and the solution of various new problems of shades and shadows.

The course in drawing includes instruction and practice in the use of instruments; the pen and brush, with india ink, in drawing mathematical forms in projection and perspective; shading them; casting their shadows, and washing them. This is followed by an application of the principles learned to the execution of a drawing of a machine, or the section of a furnace, wherein the shadows are accurately calculated and washed, and the drawing is appropriately colored.

In the second year the course includes, during the first session, the drawing of machines, mills, furnaces, &c., from plane models. These are shaded, their shadows calculated and cast, and the whole properly colored. The dimensions are also quoted, so that these drawings serve as types of working drawings.

During the second session the students draw from various models in relief, chiefly furnaces and machines. They first make a free-hand sketch from the relief, and upon it place the dimensions which they measure; subsequently they draw the finished representation, in the academy, to a proper scale, with shades, shadows, colors, and dimensions. This practice is of benefit in accustoming the student to take rapid sketches of established works, upon which he may be required to report, or by which he may wish to inform himself.

MODERN LANGUAGES.—The design in this department is to teach the student how to read French and German scientific books with facility.

Instruction is given for two hours a week in each of these languages, during two years; and as the text-books employed in the class-room are altogether works on science, the students can acquire a sufficient vocabulary to enable them to use French and German authors in all the departments of the school.

No attempt is made to produce accomplished scholars in all branches of German and French literature, but attention is concentrated upon the immediate wants of the young men. In this way no time is lost, and the instruction becomes thoroughly practical.

GENERAL CHEMISTRY.—The preparatory class attend three exercises a week in general chemistry throughout the year. It is intended to lay the foundation of a thorough knowledge of the theory of the subject preliminary to the practical instruction in the chemical laboratory. For

this purpose the class is drilled upon the lectures, with free use of the best text-books. The students are expected to write out full notes, which must be exhibited to the professor at the close of each session. At the end of the year the class must pass a rigid examination before they can be admitted to a higher grade.

The first year students also attend three times a week, during the year, in general chemistry, and receive instruction in the chemical properties of the metals and of their compounds; they also have a course in organic chemistry, adapted to the wants of special scientific students. The text-book for reference in this department is Roscoe's Chemistry, English edition, 1869; and the notation adopted is in accordance with the unitary atomic system.

ANALYTICAL CHEMISTRY.—There are two laboratories devoted to qualitative analysis, and one of larger size to quantitative analysis, besides the assay laboratory. These laboratories are provided with all the necessary apparatus and fixtures, and each is under the special charge of a competent assistant. Each student is provided with a convenient table with drawers and cupboards, and is supplied with a complete outfit of apparatus and chemical reagents.

During the first year qualitative analysis is taught by lectures and blackboard exercises, and the student is required to repeat all the experiments at his table in the laboratory. Having acquired a thorough experimental knowledge of the reactions of a group of bases or acids, single members of the group or mixtures are submitted to him for identification. He thus proceeds from simple to complex cases till he is able to determine the composition of the most difficult mixtures. Constant use is made of the spectroscope in these investigations.

When the student shows, on written or experimental examination, that he is sufficiently familiar with qualitative analysis, he is allowed to enter the quantitative laboratory.

During the second and third years quantitative analysis is taught by lectures and blackboard exercises, and the student is required to execute in the laboratory, in a satisfactory manner, a certain number of analyses. He first analyzes substances of known composition, such as crystallized salts, that the accuracy of his work may be tested by a comparison of his results with the true percentages. These analyses are repeated till he has acquired sufficient skill to insure accurate results. He is then required to make analyses of more complex substances, such as coals, limestones, ores of copper, iron, nickel and zinc, pig iron, slags, technical products, &c.; cases in which the accuracy of the work is determined by duplicating the analyses, and by comparing the results of different analysts.

Volumetric methods are employed whenever they are more accurate or more expeditious than the gravimetric methods. In this way each student acquires practical experience in the chemical analysis of the ores and products which he is most likely to meet in practice.

STOICHIOMETRY.—Stoichiometry, the arithmetic of chemistry, is taught in a special course of lectures and blackboard exercises during the second session of the first year.

ASSAYING.—During the third year the student is admitted to the assay laboratory, where he is provided with a suitable table and a set of assay apparatus, and where he has access to crucible and muffle furnaces, and to volumetric apparatus for bullion assay by the wet process. The general principles as well as the special methods of assaying are explained in the lecture room, and at the same time the ores of the various metals are exhibited and described. The student is then supplied with suitable material, ores of known composition, and is required to make assays himself. He first receives ores of lead, the sulphuret, carbonate, and phosphate, which he mixes with the proper fluxes, and heats in the furnace, obtaining a button of lead which he carefully weighs, thus determining the percentage of metal in the ore. He then determines by cupellation the amount of silver in the lead. Silver ores are next given to him, at first those which are most easily assayed, such as mixtures of chloride of silver with quartz; afterward more complex ores, such as galena, ruby silver ore, mispickel, fahlerz, &c. These he is required to assay both in the crucible and in the scorifier. Ores of gold are next supplied, auriferous quartz, slates, pyrites, blende, &c., which are assayed by the most reliable methods.

To facilitate the assay of ores of the precious metals a system of weights has been introduced, by which the weight of silver or gold globules obtained in the assay shows at once, without calculation, the number of troy ounces in a ton of ore.

The student then passes on to the assay of silver and gold bullion, the former by Gay-Lussac's volumetric method, the latter by "quartation" or "parting" Ores of tin, antimony, and iron are then assayed in the dry way, when the course is completed. Each student thus executes two or three hundred assays himself, under the immediate supervision of the instructor.

APPLIED CHEMISTRY.—The instruction in applied chemistry extends through the second and third years, and consists of lectures, illustrated by experiments, diagrams, and specimens. The subjects discussed are:

I. Chemical manufactures—acids, alkalies, and salts.

II. Glass, porcelain, and pottery.

III. Limes, mortars, and cements.

IV. Fuel and its applica ions.

V. Artificial illumination—candles, oils, and lamps, petroleum, gas, and its products.

VI. Food and drink—bread, water, milk, tea, coffee, sugar, fermentation, wine, beer, spirits, vinegar, preservation of food, &c.

VII. Clothing—textile fabrics, bleaching, dyeing, calico printing, paper, tanning, glue, India-rubber, gutta-percha, &c.

VIII. Artificial fertilizers, guano, superphosphates, poudrettes, &c.

IX. Disinfectants, antiseptics, preservation of wood, &c.

MINERALOGY.—The studies in the department of mineralogy continue through two years. In the first year the students are instructed in crystallography and the use of the blowpipe. The lectures on crystallography are illustrated by models, which the students are required to determine under the eye of the professor. A collection of glass models, and of models in wood, illustrating all of the important actual and theoretical forms, is always accessible to the students. The exercises in blowpipe determination are entirely practical; known mixtures are first given to the student to examine, and when he is sufficiently familiar with them, unknown mixtures are determined. In the second year the lectures are illustrated by conferences, where the student is required to determine minerals by their physical and blowpipe characters. The mineralogical cabinet contains about eight thousand specimens, which are labeled and open to the public. Besides this, there is a collection of about two thousand specimens, to which the students have an unrestricted access.

GEOLOGY.—The course of instruction in this department is as folows:

First year.—Botany and zoology as an introduction to paleontology; lectures througho it he year.

Second year.—Lithology: minerals which form rocks, and rock masses of the different classes; lectures and practical exercises. Geology: cosmical, physiographic, and historical; lectures throughout the year.

Third year.—Economic geology: theory of mineral veins, ores, deposits and distribution of iron, copper, lead, zinc, gold, silver, mercury, and other metals; graphite, coal, lignite, peat, asphalt, petroleum, salt, clay, limestone, cements, building and ornamental stones, &c. Paleontology: systematic review of recent and fossil forms of life; lectures throughout the year.

METALLURGY.—The metallurgical course inclu 'es 'ectures on the preparation of fuels, constructions of furnaces, the manufacture of metals, projects and estimates for the erection of metallurgical works. The lectures cover a period of two years, and discuss in detail the methods in use in the best establishments in t is country and in Europe for the working of ores, with practical details of charges, labor, and cost of erection, obtained from the most authentic sources. Special attention is given to ores of this country which are difficult to treat, and to the solution of practical problems which are likely to occur. The lectures are illustrated by models, drawings of furnaces, and collectio is of metallurgical products. The projects assigned to the students familiarize them with the method of making plans and estimates for the erection of works. The ore to be worked and the various conditions which are required are given to the student at the close of the second year. During the summer vacation he is expected to visit works and to ascertain what the practical requirements are. Dur ng the third year the drawings, estimates, and descriptions of the processes are completed and submitted for inspection and approval.

MINING ENGINEERING.—Mining engineering is taught during the second year. The instruction comprises a course of lectures illustrating the theory and practice of mining operations at home and abroad; giving the general principles of reconnoitering and surveying mineral property and mines; the attack, development, and administration of mines, and the mechanical preparation of ores, with the exhibition and use of all necessary reconnoitering and surveying instruments, particularly the mining theodolite, and the exhibition of various models.

In surveying the student is taught to make surface surveys of the limited extent he needs, and subterranean surveys to direct and adjust his works; also, the solution of some problems of underground surveying by descriptive geometry, and many special examples of determining lines on the surface corresponding to given lines below, &c. Attack describes the miners' methods, the use of drills, picks, powder, nitro-glycerine, compressed air, &c.; the proper location and construction of tunnels, slopes, shafts, wells for sounding, artesian wells, salt and oil wells, preceded by a theory and description of the most typical veins, true or irregular, and other deposits of ore, salt, coal, and oil, exemplified at home and abroad.

Development includes the best methods for laying out subterranean works for production and conservation in the present and future; for proper and economic ventilation, transportation, hoisting, pumping or draining, distribution of workmen, &c.

Administration includes a review of the foregoing, with regard to a concentration of ideas and a general comparison of production cost to market price of untreated ore. Here the student is taught to forecast the expense of the establishments he must make, their annual cost, the cost of miners, employés, machines, material, &c., and offset these with the result of production, so endeavoring to solve the problem of making a given mine pay in given circumstances, by scientific attack, distribution, and general rational economy.

Mechanical preparation describes the various accepted methods of reducing massive ores to a condition either yielding metal or fitting the material for metallurgical processes. Models of stamps, crushers, shaking-tables, sluices, &c., are exhibited with plans and sections of mills and coal-breakers.

MACHINES.—The course on machines, which is inseparable from that of mining engineering, is given during the third year. It teaches the theory of the machines used in mining works. It is the application of mechanics to the construction of water-wheels, turbines, wind-mills, steam and hot-air engines, pumps and ventilators, transmission of force by compressed air, and the formulæ, with their theory, for the resistance of materials. Models of water-wheels, steam-cylinders, steam-engines, blowing machines, &c., are exhibited.

In the resistance of materials the calculations are shown for the sections of different parts of machines, the fly-wheel, pump-rods, connect-

ing-rods, &c., also for such constructions as retaining walls, arches, timbering, supports, &c. The course of the third year also includes a plan of drawing and estimates for some projected work of mining or the construction of a machine for some of the uses of mining.

This system of projects is to the young engineer a real practical application of all his three years' study, by which he is made to investigate prices, compare theories, models, methods, and dispositions, and, in competing with his class, to take pains to furnish the best arguments, illustrations, and calculations he can in order to support his views.

LIBRARY AND COLLECTIONS.—A special scientific library and reading-room have been provided for the use of the students of the school, which already numbers two thousand volumes, and which is rapidly increasing. Seventy of the best foreign and American scientific journals are regularly received. Collections of specimens and models illustrating all the subjects taught in the school are accessible to the student, including crystal models, minerals, ores, and metallurgical products, models of furnaces, collections illustrating applied chemistry, fossils, economic minerals, rocks, Olivier's models of descriptive geometry, models of mining machines, models of mining tools.

The lectures on crystallography are illustrated by a collection of one hundred and fifty models in glass, which show the axes of the crystals, and the relation of the derived to the primitive form. This suite is completed by three hundred and fifty models in wood, showing most of the actual and theoretical forms.

The collection of minerals comprises about eight thousand specimens, arranged in table cases. The minerals are accompanied by a large collection of models in wood, showing the crystalline form of each; arranged in wall cases are large specimens, showing the association of minerals.

A collection of metallurgical products, illustrating the different stages of the type process in use in the extraction of each metal, is accessible to the students. This collection is constantly increasing. Most of the specimens have been analyzed and assayed.

An extensive collection of models of furnaces has been imported from Europe. A very large number of working drawings of furnaces and machines used in the different processes are always accessible to the students; and several thousand specimens of materials and products illustrating applied chemistry have already been collected.

The geological collection consists of over sixty thousand specimens, including systematic series of rocks, fossils, and useful minerals. In this series is to be found the largest collection of fossil plants in the world, including many remarkably large and fine specimens, and over two hundred new species, of which representatives are not known to exist elsewhere. Also, the most extensive series of fossil fishes in the country, including, among many new and remarkable forms, the only specimens known of the gigantic dinichthys; a suite of Ward's casts of extinct saurians and mammals; a fine skeleton of the great Irish elk, &c.

REQUIREMENTS FOR ADMISSION.—Candidates for admission to the first year of the school must not be less than eighteen years of age. They must pass a satisfactory examination in algebra, geometry, and plane, analytical, and spherical trigonometry, physics, and general chemistry.

Candidates for the preparatory year must be seventeen years of age, and must pass a satisfactory examination in arithmetic, including the metric system of weights, measures, and moneys, and in portions of algebra and geometry. Those who are not candidates for a degree may pursue any of the branches taught in the school.

During the session the students visit, with one of the professors, the different machine-shops and metallurgical establishments of the city and its environs. During the vacation each student is expected to visit mines, metallurgical and chemical establishments, and to hand in, on his return, a journal o his travels, and a memoir on some subject assigned him. He is also required to bring collections, illustrating his journal and memoir, which collections are placed in the museum, reserved as a medium of exchange, or made use of in the laboratories. For pupils who have been proficient, and who desire to devote special attention to any one branch, application will be made for permission to work in particular mines or manufactories. This will be done only as the highest reward of merit that the institution can give. Prizes are awarded to students who pass the best examination in mineralogy, qualitative and quantitative analysis, and assaying, &c. At the close of the course are conferred degrees of engineer of mines, bachelor of philosophy, and doctor of philosophy.

The fee for the full course is $200 per annum.

Special students in chemistry pay $200 per annum. Special students in assaying are admitted for two months for a fee of $50 in advance. The fees for single courses of lectures vary from $10 to $30. Students unable to meet the expenses of the school are instructed gratuitously.

CONCLUSION.

As mining is such an important department of American industry, it may be presumed that, at least in all those States possessing large mineral deposits, the many colleges to be erected under the provisions of the congressional act of 1862 will make liberal provision for instruction in the science and art of both mining and metallurgy, and thus save our country from the further necessity and discredit of looking to foreign lands for the education of engineers competent to locate, open, and direct our mines, and construct and manage our metallurgic establishments.

It is encouraging to note that already the subject of the establishment of a central government school of mining has been discussed in Congress, and ably advocated by Senator Stewart, Commissioner J. Ross

Browne, and by Commissioner Raymond in his report for 1868. It has also been discussed by Professor Blake in the Report on the Precious Metals.

Before closing this notice of the mining schools of the country the establishment of a mining school in Mexico during the last century should be mentioned.

In Mexico a "Royal Seminary of Mines," and school for the instruction of those intended for mining, was established by an ordinance in 1783. The expenses of the erection, maintenance, and improvement of the seminary were defrayed out of the endowment fund of mining, and the direction was intrusted to the director-general of mining, together with the royal tribunal-general of mining.

The professors, before being appointed, were required to solve certain problems in the art and science of mining and to deliver a lecture of two hours' length on points which the director at the moment proposed, and in the presence of the royal tribunal and of the notary.

The master professors, besides teaching daily by theoretical and practical lessons, were required to present, once every six months, a memoir or dissertation on some subject useful and advantageous to mining. These memoirs were read to the royal tribunal and were preserved in its archives in order that they might be printed and published whenever it appeared expedient. The instruction was free, and at the outset provision was made for the support and clothing of twenty-five children, Spaniards or noble Indians of legitimate birth, preference being given to the relatives of miners, and especially to those whose ancestors had resided in the mining districts.

VI.—SCHOOLS OF ENGINEERING.

Under the head of schools of engineers it is proper to include all classes of schools in which it is the main object to teach the mathematical, physical, and natural sciences in their direct relations to the construction of important works. The first professional schools of engineering were general in character; but as the sciences developed and different departments of public enterprise became more extended, special schools were demanded, and we now have, taking the nations under survey, a great number of schools of mechanical engineering, schools of civil and topographical and hydrographical engineering, schools of bridges and highways, schools of marine engineering, and schools of military engineering.

In some cases they are found as separate and distinct institutions—which is the case oftener than otherwise with the military and hydrographic schools; in others, and more generally, in connection with and an essential part of the polytechnic schools. Among the schools of the scientific professions none are so universally found in all enlightened countries.

In France, England, Belgium, the German states, Russia, Austria, Italy, Spain, and Switzerland they have already been thoroughly estab-

lished, in the appreciation of governments and people, as of first importance; while in the United States and in several of the South American states they are now engaging the public attention and receiving a rapid development. In the subsequent treatment of polytechnic schools I shall illustrate the scope and character of the teaching in the engineering departments of those great institutions, and, in this connection, will limit myself to such brief account as will serve to convey an idea of the condition and progress of this profession in the countries either most noted for their engineering achievements or for their recent endeavors to make progress in this direction.

FRANCE.

In France, whose position is foremost among the nations in this department—her highways, railroads, canals, harbors, and fortifications being models worthy the imitation of the other powers, and her engineers being found to-day at the head of the most important public works in every part of the world—the profession is more especially taught than in any other country, and with a degree of thoroughness hardly equaled in the civil and hydrographic departments.

The foundation of engineering as a science is first firmly and thoroughly laid at the Imperial Polytechnic School, in which the instruction in the mathematical and physical sciences is unsurpassed; and no young man of the empire can hope to enter any important branch of the public service by any other door. Pretension is of no avail. The ordeal of successive examinations by the ablest and most relentless scientific men of the country stands resolutely in the way of undesirable candidates. When at last ready for admission to the study of the chosen branch of the service, they who would enter the civil department as directors of imperial operations on the land—such as the building of bridges, canals, railways, and the public highways of the empire—are received at the School of Bridges and Highways, (*École Impériale des Ponts et Chaussées,*) at Paris, an institution under the control of the minister of agriculture, commerce, and public works. Such as wish to become hydrographic engineers or marine engineers attend the *Écoles d'Hydrographie* and the *École Impériale Navale*, which are under the control of the minister of the marine. Those who design to enter the profession of mining engineering are received into the *École Impériale des Mines;* and such as propose to enter the military service in the engineering department are further prepared at the military schools.

At the *École Impériale des Ponts et Chaussées* pupils not candidates for admission into the service of the state as members of the corps of engineers are also admitted, if between the ages of eighteen and twenty-five years and competent to pass the requisite examinations. These consist, first, of written compositions, one or more, on subjects named in the prescribed programme; secondly, the execution of a design in descriptive geometry and flat-wash architectural drawing. If the candidate is then

approved he is admitted to the oral examinations in arithmetic, algebra, geometry, plane trigonometry, analytical and descriptive geometry, differential and integral calculus, mechanics, physics, chemistry, and architecture. Having successfully passed these several examinations, he is admitted to a three years' course of study, embracing all the sciences in their higher range and in their special applications. The school year begins with the 1st of November and ends with the 30th of April, the vacation being spent in connection with the public works in progress of execution in various portions of the country. Instruction in this school is gratuitous.

SPAIN.

Spain presents the anomaly of being among the most backward of all the countries of Europe, as before remarked, in matters of general education, and yet among the foremost in this particular department under consideration. At an early date—quite before the establishment of schools of engineering in several of the more enlightened and more powerful nations—the aspirations of the Spanish government for high rank in the matter of public works led to the establishment at Madrid of a special school of bridges and highways. It was not until 1834, however, that it came to have a settled and undisturbed existence. Since that date it has sent forth not a few engineers of high merit, whose accomplishments in the construction of public works have contributed much to the reputation at present enjoyed by the Spanish corps of engineers.

This school is under the superintendency of a superior commission, composed of an inspector general (of the corps of engineers, bridges, and highways) of the first class as president, the director of the school, two inspectors general of the second class, and one professor of the school as secretary.

Applicants for admission as regular pupils must present the diploma of bachelor and undergo an examination in four distinct series, bearing upon the following subjects, to wit: arithmetic; algebra, embracing the theory of equations; geometry; plane and spherical trigonometry and the use of logarithms; analytical geometry of two and three dimensions, comprehending curves and surfaces of the second degree; design; and correct translations of the French and English languages.

The full course of instruction is divided into six annual courses, and is so complete and thorough that I deem it proper to present it in full, as follows:

First year. Infinitesimal calculus, comprehending differential and integral calculus, the elements of elliptic transcendents, the calculation of finite differences and of equations; descriptive geometry, embracing its applications to perspective and the determination of shadows, as well as graphic problems relating to all portions of this branch of the science; physics, in its special relations to the science of engineering; topographical, design, and landscape drawing.

Second year. Rational mechanics, embracing statics, dynamics, and the elements of hydraulics; geodesy, including topography, terrestrial and celestial geomorphy, gnomonics, the tracing of charts and plans, with all the necessary graphic exercises; chemistry, as applied to the analysis of waters and materials used in constructions, with practice in the laboratory; topographical, design, and landscape drawing.

Third year. Mechanics, applied to constructions, comprehending the resistance of materials, the theory of walls and arches, of stone bridges, iron bridges, and suspension bridges, the application of the principles of hydraulics to shock, the resistance and flowing of fluids—all with graphic exercises and practice; stereotomy, applied to stone, wood, and metals, with the solution of graphic problems and the construction of models in plaster; geology and mineralogy in their applications to the exploration of lands and the exploitation of materials; construction, (part first,) including a study of the preparation of materials, the execution of all kinds of masonry, and the construction of carpenter's work in wood or in iron, with graphic exercises and the execution of projects.

Fourth year. Construction, (part second,) including foundations, auxiliary works, embankments, tunnels, bridges, and viaducts of all classes, with the formation of plans and other practical exercises; the application of hydraulics, embracing irrigation, drainage, and the distribution of water; machines—their theory, their construction, and the study of meters and generators in ordinary use in public works—with graphic exercises and excursions to visit important workshops and factories.

Fifth year. Navigable rivers and canals, including the study of inundations, and various graphic and practical works relating to this subject; ordinary highways, with the formation of plans of routes and the construction of roads; architecture, embracing the distribution and decoration of edifices, the history of art, (especially Spanish art,) together with graphic exercises looking to the formation of architectural plans; excursions to the most important public works, Spanish and foreign.

Sixth year. Railroads, their construction and exploitation; the study of railway carriages and other vehicles of every kind, as well as of electro-telegraphy; ports and maritime works, embracing the study of ports, light-houses, and the buoyage and lighting of coasts; political economy and administrative rights, with the special study of those sciences which have more remote application to public works.

The full corps of professors numbers eighteen, besides the director.

As auxiliaries to the courses of instruction given by the faculty, there are connected with this school a valuable scientific library of 11,000 volumes; a museum of models of machines, apparatus, and diverse constructions; a collection of the woods of Spain, with all sorts of tools and implements used in various exploitations; a cabinet of physical apparatus; geological and mineralogical collections; collections of hydraulic, mechanic, and geodetic instruments; and powerful machines for testing the resistance of materials.

After this partial introduction to the central source of engineering science in Spain, we are better prepared to understand how it is that some of the most remarkable mountain railways and other works have been built by Spanish engineers.

ITALY.

Italy is also found in the same category with Spain, as doing less for the education of the people in general, as well as for education in the scientific professions, than the other leading and many of the lesser neighboring powers, and yet as taking the engineer under special protection. In like manner, her more recent public works are of a character to applaud and sanction the wisdom of this fostering care, as every one must testify who has passed over that remarkable mountain railway between Pistoja and Ferrara.

The royal schools of application for engineers, (*scuole d'applicazione pergli ingegneri*,) located at Turin, Milan, Naples, and Ferrara, are all of superior rank, providing excellent courses of instruction, with corps of twenty to thirty professors and teachers, and being furnished with laboratories, libraries, and means of illustration. Engineering is also quite generally taught, and to more than the usual extent for schools of that character, in the *scuole techniche*, of which notice has already been made in another place.

AUSTRIA AND OTHER GERMANIC COUNTRIES.

In Austria and the other Germanic states, as also in Switzerland and Belgium, polytechnic schools of high rank, and all including schools of engineering, so abound that there is but little need of separate ones.

DENMARK, NORWAY, RUSSIA.

In Denmark provision is made for engineering in the Polytechnic School at Copenhagen, of which some notice will be made in another place.

Norway has a school for instruction in mechanics and engineering connected with the naval workshops at Carljohausværn, which is open alike to youths and adults. The course of study embraces elementary and higher mathematics, mechanics, physics, &c. The teachers are nominated by the navy department and supported by the state. Tuition is free. This school as yet occupies but a limited field, but is well attended, and is about being enlarged both in accommodations and in the number of its students. Engineers in the service of the royal navy must attend the school before advancing into the higher grades.

Russian schools of engineering are invariably connected with the polytechnic institutions.

NORTH AND SOUTH AMERICA.

In the Western World, the grandest theater for engineering operations on the globe, professional instruction is at present confined to rather

brief courses in the two or three polytechnic schools, and perhaps an equal number of incipient departments in the new colleges of agriculture and the mechanic arts of the United States, and to the central college of Brazil at Rio Janeiro, which last, however, is a noble institution, with a six years' course quite equal to that of Spain, and is relatively more worthy than any we have of the empire in whose interest it was established.

I trust that with the rapid development of our numerous colleges of the mechanic arts now being planted in all the northern and in some of the southern States we shall soon be able to give to our young men of mathematical and mechanical genius a professional training in this department of applied science that shall be inferior to that of no other country in the world.

VII.—SCHOOLS OF ARCHITECTURE.

The subject of architecture and of schools of architecture, as connected with the Exposition of 1867, possessed unusual interest, by reason of the remarkable illustration it had in the multitude of the models, plans, and designs presented of structures of every class within the domain of that art, as well as in the economical construction of the Palace itself, and in the large number of varied and interesting representatives of the architecture of different nations in the Exposition Park.

Schools of architecture, distinctively considered, are a growth of the present century, though as an occupation, and to some extent as an education, it has had a development coeval with that of agriculture, which together constituted the primal arts of the race. It is due to the people of the times preceding these institutions, and to the architectural works they have left behind them, to say that it had reached in their hands a culmination never since equaled by the teachings of modern schools in the two great essentials of the art, durability and symmetry.

Schools of architecture are now found in most of the civilized countries of the world, Germany alone furnishing them to a total of not much less than forty, scattered through its principal towns and cities. Here, as in France, Austria, Italy, Switzerland, Russia, the Scandinavian states—Norway, I believe, excepted—and even in Brazil, architecture has the dignity of a profession taught in special schools, or in the associated schools of polytechnic institutions.

In illustration of the wide range given by science to the education of the architect, a brief summary of the subjects in which instruction is given in the Royal Architectural Academy of Berlin will here be made: physics; chemistry; mineralogy; the nature of materials; descriptive geometry; perspective; analytical geometry; statics; hydrostatics; mechanics; hydraulics; ærodynamics; machinery; laws of constructing all parts of edifices and machines; the monuments of antiquity; the comparative history of architecture; architectural machine-drawing, in its full extent; the construction of roads, railroads, and canals; rural

and city ornamental architectnre; plans, calculations, and estimates for every variety of building; geodesy; and the general management of architectural bnsiness.

This course of instrnction, by more than a score of professors and numerons assistants, covers from five to seven years, according to the ascertained proficiency of the student, whose admission to the academy involves a stipulated amonnt of both general and special scholarship, such as may be secured at the gymnasium and real-school.

The certificates from this institution are of two grades—that of builder, after a two years' selected course and one year of practice; and that of architect, after three years' study and two of practice. A failure at examination for either of these may be supplemented by an additional year of study before being finally furnished with or dismissed without the honors of the institution.

The Central School of Architecture at Paris receives pnpils thns accredited: those from home departments mnst bring a certificate of general acquirements in the usual branches of school study; and of some special training in drawing and designing, and of aptitude for the profession they aspire to enter—the first from a well-known local professor and the second from an architect, both named by the director of the Paris school; and those from abroad, the same from an accredited architect and a professor of some university. Applicants must also present to the committee of examination samples of their own work, to the extent of a model in ornamental bas-relief, a design in crayon giving both the gronnd plan and the elevation of a building, and a description of it in writing. To this is added oral examinations in arithmetic, algebra, geometry, trigonometry and descriptive geometry, and geography. Having established so mnch, the candidate next furnishes illustrations of his work in relation to questions on descriptive geometry, and, if he has made any progress in the previous study of it, samples of his drawings and essays on architecture. Passing these tests with credit, the candidate is admitted to the gratuitous instruction of the school; and failing, he pays the expense of his examination and goes his way.

The conrse of stndy is arranged for three years before the student is admitted to an examination, which, if satisfactory, brings a certificate of honorable dismissal. In case of a failure at this time, and there is no lack of natnral aptitnde discovered, the pnpil may pnrsue one more year of stndy, either here or with private tnition, before he is permitted one more, and this time a final, test of proficiency.

For fuller details of courses of study in schools of this class, see a subsequent notice of those connected with polytechnic establishments.

VIII.—SCHOOLS OF NAVIGATION.

When special schools for instruction in navigation had their origin, it is difficnlt to say; though it is evident that the date of scientific schools of this kind does not lie behind the invention of the compass and the

astronomical instruments essential to a bold and free exploration of the seas; since, before that period, when the sailor crept along the shores of narrowly-inclosed waters, and was chiefly in need of a practical knowledge of the craft in which his voyage was made, navigation was only a rude art. But when, in the fourteenth and fifteenth centuries, came those inventions and discoveries which gave the navigator true ideas of the form of the earth, and put him in familiar relations with the heavens, so that he was henceforth at home wherever the face of the sun might be seen, and could fearlessly turn the prow of his ship into unknown oceans, navigation became a science, and in some form was taught in the schools.

In that country that gave to the world not only the compass and the telescope, but also a Columbus and Vespucius, and whose navigators and sailors are still among the best in the world, instruction in the principles of navigation is mainly given in the university faculties of physical, mathematical, and natural science. In Spain, entitled to share with Italy the honor of opening the way to the New World, and which, for a time, led all the nations in its command of the waters of the globe, it is also taught in like manner. But in Russia, whose scope for navigation is more in the future than in the present; in Prussia, whose freer way to the sea has only been lately fought for and secured; in heroic Netherlands, once mistress of the seas, and whose present more domestic daily life is a literal voyage; in old Scandinavia, from whose rugged shores, almost a thousand years before science came, went forth those grim and daring Anglo-Danish, and Northmen adventurers into the Northern Ocean, and even cruised in the Mediterranean Sea; in Great Britain, whose navies proudly ride in the waters of every sea on the globe; in France, great but not foremost in her merchant and military marine—in all these countries there are, and have been for many years, special schools for the instruction of youth and men in the science and art of navigation.

We, also, of the Western World, are navigators of the seas, and our ships are at home in all waters. But unless I am strangely in error, in the matter of provision for that instruction of our navigators and seamen which the commerce of our country demands, and will every year more and more demand, we may with profit turn to the example of some of the other powers, whose movements of late indicate a higher appreciation of their interest and duty in this regard.

Perhaps, also, the recent attention given by European governments to this matter is partly due to the fact that the changes wrought in the art of navigation by the introduction of steam, as a propelling power for ships, have necessitated a reorganization of the old schools no longer fully equal to their work. Be this as it may, it is a notable fact, and one brought to the attention of civilized nations by representations made at the Exposition, that the schools of navigation of even France and England—countries long foremost in this department of special

edncation—have been hitherto neither as numerous nor as good as the nature of the service and the extent of their maritime interests demand, and that they are therefore earnestly at work in mnltiplying and improving them.

FRANCE.

In France the schools of navigation are of various grades and character; some of them being for mere children, whose fathers follow the seas and desire themselves to be followed by their offspring; some for yonths, above the minimum of thirteen years of age; some for more advanced and somewhat experienced seamen under the maximum age of twenty-three, whose destiny is to take command either of vessels designed for foreign trade or for coasting along the shores in domestic trade. Of whatsoever class, they are free, and under the control of the minister of marine and of the colonies.

The aim of the government is the establishment of a great number of nurseries, from which, by a carefully-devised system of promotions, the filling of vacancies or the supplying newly-created places in the commercial navy may always be by transfer from a school whose thorongh teaching is a guarantee of fitness for the service.

As early as 1791 the National Assembly decreed the existence of gratnitous instruction in navigation in thirty-four of the maritime cities. Afterward, the schools were increased to forty-two, the present number. The instruction in these several schools is given by at least one competent navigator, and is divided into two courses—one elementary and essentially practical for the formation of masters of coasting vessels, the other superior, and both practical and theoretical, designed for the qnalification of candidates for the captaincy of vessels employed in foreign commerce.

Pupils may be admitted at thirteen years of age, thongh the attendance is usually by young men of over twenty, who, after completing their primary instruction in navigation at the lower schools, and spending some years in the marine service, desire to add the studies requisite to their admission to the rank and position of master or captain.

The elementary course embraces the following studies: practical arithmetic; geometry; practical navigation; elementary principles of the construction of steam-engines; nautical calculations.

The superior course inclndes: arithmetic; algebra and geometry; plane and spherical trigonometry; elementary principles of astronomy; practical navigation; the nse of nautical instruments and nautical tables; practice in making calculations; study of the steam-engine in its applications to navigation; the French language.

The examinations are held annually by persons detailed by the government for that purpose, but no one can be admitted to a trial of his qualifications who has not attained the age of twenty-four, and who has not served on board a French vessel of some description for the term of five years.

The practical examinations are conducted by experienced captains of vessels, and embrace the rigging of ships; maneuvering of sail-vessels and steamships; knowledge of coasts, currents, tides, and gunnery.

If successful in passing this ordeal, the candidate receives a certificate of aptitude, and may then present himself for examination on the theoretical courses taught in the school.

These schools of navigation (*Écoles d'hydrographie*, as they are somewhat inappropriately called) were attended in 1867 by a total of 1,500 pupils—the number graduated being, of masters, 301; of captains, 219.

Of the schools of lower rank, including schools of apprenticeship, ship-schools, &c., I do not deem it necessary to speak except to say that, with the reorganizations and changes lately effected, and the increased attention to instruction in the construction and management of steam-engines, &c., they promise greater usefulness than heretofore.

ENGLAND.

In England the reorganization of schools of navigation began in 1853 by the transfer of their supervision from the mercantile marine department of the Board of Trade to the newly-created department of science and art. Instruction in navigation had long been given by private teachers in the seaport towns to a comparatively small number of those whose responsible duties demanded the most thorough preparation. Realizing the necessity for the improvement of this condition of things, the marine department of the Board of Trade had already created two schools, one at London and one at Liverpool, making an arrangement with the admiralty to permit the special fitting of graduates from the Royal Naval School for the position of masters in these schools and in others that might be established. Subsequently, under the administration of the department of science and arts, seconded by boards of trade in the cities, the number of those established by joint efforts of government and municipal boards was increased to eighteen; their location being in all the most important seaport towns.

The age at which pupils may be admitted varies considerably, though not designed to fall below twelve years. The minimum age at which boys are received upon merchant ships being fifteen, it is deemed important to enlist them as pupils in the navigation schools before they become inclined to some other profession. Competent teachers, subject to visitation and supervision from the appointees of the department, are employed by it at a fixed amount; the remainder being made up by aid from the municipal boards and by fees from the pupils. The amount paid by government is determined by the character of the certificate held by the master; the amount paid for superior proficiency in certain groups of subjects being greater than that paid for proficiency in certain other groups. For example: proficiency in mathematics, chemistry, natural history, drawing, and the adjustment and skillful handling of instruments, entitles the master to £5 for each of those branches; while

success in physical geography, in physics, mechanics, marine steam-engine, to £10; and in general navigation and nautical astronomy, to £15.

The fees paid by pupils differ somewhat for the different schools, and, in any given school, vary with the grade and studies of the pupil. In the London school, boys intending to be seamen, but not navigators, pay *6d.* per week; boys studying navigation, *1s.*; seamen not studying navigation, *1s.*; apprentices on ships not studying navigation, *1s.*; apprentices studying navigation, and all others above their grade, *6s.*

Every school is divided into an upper and a lower section, each with at least one master.

The lower section is principally composed of apprentices and seamen who are employed during the day at their ships in the docks, and who have acquired the rudiments of an English education before entering the service. However short their stay in port, they are encouraged to attend the school, between six and nine o'clock in the evening, to acquire a knowledge of the principles of ship-sailing, the use of nautical instruments, &c. Instruction is also given during the day to regular pupils.

The course of instruction in this section comprises: reading and writing; correspondence; arithmetic; geography; the sailings; use of the sextant; and method of keeping ship's books.

The upper section is for the instruction of masters and mates in the science of navigation. The course of instruction in the best of the schools includes: algebra to quadratics with application; geometry, (I, II, III, Euclid;) plane and spherical trigonometry; navigation; nautical astronomy; practical use of the instruments used at sea; physical and descriptive geography; chart-drawing and free-hand drawing; surveying; history, especially Scripture and English history; letter-writing and book-keeping; mechanics and steam-engine; magnetism and electricity as related to ships; laws of storms and tides; study of the code of signals; mercantile laws and usages, (so far as demanded by the masters of ships;) gymnastics.

The government provides the several schools with the necessary instruments, and disburses aid according to a plan carefully prepared.

The number of pupils of every class attending these schools at present is between three and four thousand.

In my visits to various schools not alone in England and France, but also in other countries less maritime than they, I have been deeply impressed with the office they are fulfilling, not only in the way of insuring to commerce a larger proportion of skilled and trustworthy mariners for the growing commerce of the nations; but, also, with the moral influence they are calculated to exert upon a large class of persons always heretofore neglected as being incorrigibly depraved—I mean sailors generally—who, though not one in a thousand may actually attend the schools, will nevertheless derive indirect advantage from association with, or subordination to, the few who do attend them.

Why may we not establish one such school of navigation in each of our large commercial towns, giving thorough and free instruction to such of our actual and prospective navigators and seamen as by means of valuable day teaching and evening lectures may be induced to attend?

Surrounded, almost, by great oceans, gulfs, and inland seas; with greater total length of navigable rivers than all the countries of Western Europe put together; and having a foreign commerce whose aggregate value already equals $852,072,156; a domestic, lake and river commerce vastly superior to that of any nation in the world, and a future only limited by the wisdom with which we provide for it, we can hardly be too prompt, or too liberal and thorough, in making such provision in this department of education as shall insure to the country, in every branch of the commercial service, a class of navigators fully worthy of their important duties.

CHAPTER VIII.

COMMERCIAL, NAVAL, AND MILITARY SCHOOLS.

I. COMMERCIAL SCHOOLS OF THE UNITED STATES AND EUROPE—II. NAVAL AND MILITARY SCHOOLS OF THE UNITED STATES, ENGLAND, FRANCE, AND OTHER COUNTRIES.

I.—SCHOOLS OF COMMERCE.

UNITED STATES.

If schools of agriculture and the mechanic arts are essential to the advancement of those productive industries, it is no less demonstrable that schools are also important to commerce, which, by reason of its power to awaken and stimulate enterprise, multiply inventions, cheapen production, and establish relations of amity and intercourse among communities and nations, is thus really and directly a great civilizer of mankind.

At the late Exposition several of the great powers were represented by exhibits from their commercial schools—all of comparatively recent origin, and among the many hopeful signs of the times.

If, as is claimed by statisticians, a very small percentage of all who engage in commerce make it a permanently successful business—the vast majority either voluntarily escaping from it, or being drawn into the maelstrom of bankruptcy—is it because failure is absolutely unavoidable, or rather because it is an exceedingly difficult science, demanding, in addition to that ordinary discipline, culture, and information which every man ought to possess, a thorough acquaintance with countries, populations, and histories; familiarity with the conditions and processes of production; the nature and quality of materials and manufactures; knowledge of commercial law and international usage; and, more than all, a mastery of economical science in all its branches, and ability to cope with profound problems in social philosophy? Men of ordinary intellectual endowment, if thus qualified for commerce, would rarely fail except by reason of unavoidable disaster. That so large a proportion of those who engage in it do fail, is because so large a majority are totally ignorant of the first principles of the business.

I am aware that the attention of the American public has been more or less drawn to this subject during the past twenty years, and that within that period there have sprung up many schools intended to supply this great lack of the means of professional education. And yet it is a fact that cannot be disguised, that, while they do undoubtedly accomplish much good in the way of adding somewhat to the qualifications of hundreds of our young men who would otherwise enter into mercantile pursuits without any special qualifications whatever, very

many of the hundred and fifty "commercial colleges," whose names are emblazoned on the fronts of magnificent buildings in an equal number of our great cities, to say the very least, wear larger titles than the amount and quality of instruction they give fairly warrant.

One of the most remarkable of the commercial-school enterprises of this country is the organization, by several enterprising individuals associated as an unincorporated firm, of what is styled the "Chain of international commercial colleges." This chain comprises in all forty-two schools, forty of which are located in the chief cities of the Union, from Portland to New Orleans, and the other two in Canada, at Montreal and Toronto. Being under the general direction of the proprietary company, they are severally managed in detail by local superintendents. By virtue of this association of schools under one head, the regulation is such that a student, after completing the course of studies in one, may again take them up and pursue them at another school of the chain without additional expense.

These several schools advertise to give thorough instruction in book-keeping, including merchandising, jobbing, banking, &c.; commercial law, commercial arithmetic, penmanship, and business correspondence, and some of them also furnish occasional lectures on economical science. But the course of study necessary to a diploma (and in this respect I believe there is no difference between the chain and the other private and incorporated colleges of the country) embraces but four and a half months; which, in view of the fact that nothing more in the way of preparation for admission is required than a fair knowledge of the ordinary English branches, is certainly a very brief period for the study of so important and difficult a profession.

In none of our public schools are the foundation principles of commerce taught; and, so far as I am aware, none of our scientific and polytechnic schools provide so much as a brief or partial course preparatory to this profession. And yet, by geographical position and by the tastes of our people, we seem destined to a commercial career such as no nation of the world has ever had.

But the history of foreign countries in this particular gives warrant for the hope that this department of professional instruction will not always be neglected by us as now, since it is only lately that even the most forward of them have taken decisive steps in this direction.

FRANCE.

France has the honor of taking the initiative, and that at a period in the history of the country when the old prejudices against trade had just been strengthened by many years of war, and the whole people had been filled with ideas of the glory which comes of achievements in arms, to the exclusion, almost, of all just estimates of the honor as well as necessity of industry as the only sure basis of national prosperity and greatness; at a period, in truth, when commerce was despised and

hence almost abandoned to the more ignorant and unskillful men of the country.

The first special school of commerce was founded in 1819, at Paris, under the patronage and direction of the commercial firm of Messrs. James Lafitte & Co., generously seconded by a few other intelligent merchants of the capital, zealous for the advancement and elevation of their favorite pursuit. After encountering much opposition and discouragement from the great majority, who believed the counting-room the only proper school of preparation for business, and meeting still greater embarrassment from not being able either to determine just the combination that should be made of general and special studies in the programme of instruction, or to find competent and willing professors, these gentlemen at last conceived the happy idea of calling together a number of the most intelligent and liberal of the merchants, bankers, and industrial men, with some members of the Institute of France, for the purpose of determining, by comparison of views and a full discussion of the whole subject, what should be deemed the proper course of instruction as well as the best form of organization. As a result of these conferences an organization was formed under the title of council of improvement; an organization whose labors have been of the greatest value to the commerce of France, and which, being composed of some thirty of the foremost men of the country, whether in the department of science, of commerce, or of statesmanship, still continues its useful labors.

Thus fairly established in the public confidence by the high character of the men who engaged in the movement, this enterprise commanded the sympathy and concurrence of numbers of the principal merchants and bankers of the capital, who at first discouraged it; and at an early day the institution opened with nine competent professors, charged with giving instruction in the various departments of what was intended to be made the science and art of commerce. The school was intended for both boarding and day pupils. The term of study was fixed at two years; the minimum age of pupils at fifteen years. No one could be received at all for a less period than one year.

The instruction was given in three sections; each section or division being presided over by a special chief, under the supervision of a censor of studies. The first two divisions represented two distinct grades in the department of the elementary science of commerce, and had for their object the suitable preparation of pupils for the third; the line between the several divisions being so marked that no pupil could pass from one into the other without undergoing three several examinations, the first by the chief of his division, the second by the censor of studies, and the third by the director at the head of the school.

The third division was devoted to practice; each young man having a separate bureau, in which were his account-books, treasury, &c., and receiving a capital fund consisting of fictitious bank-bills engraved for the

use of the school, moneys of all kinds and values for change, and letters of exchange upon various commercial places in Europe. Each young merchant thus established represented some business house either in France or in foreign countries, and among themselves were carried on all forms of commercial business, as though the school had been the real world. To familiarize them with the different qualities of articles found in commerce, a museum was established in connection with the school, in which the pupils, as incipient traders, were made acquainted with the appearance and properties of both the honestly-produced or manufactured articles and the fraudulent counterfeits of them.

To this practical instruction was added the study of the living languages, especially French, English, German, and Spanish, each taught by professors to whom the particular language was native, and to whom also the whole vocabulary of commercial affairs was entirely familiar; courses in commercial law, political economy, statistics, geography, the history of commerce, &c. At the end of each year there were public examinations, at which the leading merchants, bankers, scientific professors, political economists, and the public generally attended, often to the number of one to two thousand persons.

The revolution of 1830 was the occasion of the school being closed for a time; but it was at length again opened in 1838, under the auspices of the minister of commerce, who had been struck with the great services it had rendered to the country, and who accorded a considerable number of pupil-bursaries and demi-bursaries as a means of enabling poor but meritorious young men to avail themselves of its benefits. Subsequently, in 1853, it was decreed that these bursaries should be accorded only to such as merited them by personal qualities and preparatory knowledge manifested at public competitive examinations held in the principal commercial cities; and that they should be renewed annually by thirds. This measure seems to have produced important results: first, stimulating ambition for excellence in the way of thorough preparation; and, secondly, by giving to the school a sort of national character, and keeping the importance of a study of the science of commerce before the youths of the empire who looked to it as their future pursuit.

Within the past few years some modifications have been made, however, and the bursaries, no longer deemed necessary, have been discontinued. There has also been a discontinuance of the use of the bank-bills and fictitious moneys at first used, and some changes in the organization and régimé of the school, as well as in the distribution of rewards, &c. At present only boarding pupils are admitted, and the number of these is limited to 100. There are four dormitories, with private chambers, in which the pupils merely sleep, their entire active life being spent in common in the counting-rooms, in the amphitheaters, and in their recreations.

The prizes are awarded at the end of an annual examination, con-

ducted by a jury consisting of the council of improvement of the school and the professors. To such as acqnit themselves well in the first and second divisions, there are awarded two silver and four bronze medals, provided by the minister of agriculture, of commerce, and of public works; while those who rank first and second in merit in the third division receive from his Imperial Highness Prince Napoleon a medal of gold and a medal of silver as the first and second *prix d'honneur*. No certificates of proficiency in particnlar stndies are given, and all diplomas must be signed by the minister who has the school under his special patronage.

Since the origin of this institution more than 5,000 pupils have passed from its halls into the various branches of the profession; while not a few of the graduates have attained to high positions in the consular and administrative services of the state.

Of the many schools of primary and secondary grade, as well as of those of superior rank in the other cities of France, the length of the foregoing account precludes more than a very general mention; although the history of the two municipal schools of Paris, in whose four-years conrses of stndy excellent and quite complete instruction in commerce is furnished, and whose *diplôme spécial* is given by the Chamber of Commerce to such pupils as at the end of the fourth year give evidence of solid attainments, is hardly less interesting than that of the *École Spécial de Commerce* above given. I cannot, however, omit to notice the profound and intelligent interest manifested in this branch of professional education by the present distinguished and zealous minister of public instruction, who, in the law draughted by him and nnanimonsly approved by the *Corps Legislatif* and the senate in 1865, for the incorporation, with the regular course given in the *lycées*, of a course of special instrnctiou, carefully provided for the interests of commerce as well as for those of agriculture and the mechanic arts.

In France, commerce is henceforth a profession.

GERMANY, PRUSSIA, AUSTRIA.

Some of the German states, with that carefulness which pre-eminently characterizes the Germanic race, years ago made provision for special instruction in commerce in several of their schools of arts and trades, as well as here and there in a polytechnic school of higher rank. At Berlin, at Leipsic, at Nüremberg, at Dresden, and at many other points, commercial schools, both separate and associated with others, have thus existed for some time. But the most distinguished Germanic schools of commerce are those of Austria, located at Prague, Trieste, and Vienna; those at the latter place being not only the most noted, but also especially entitled to mention here as having been represented at the Exposition.

At abont the same date with the commencement of the Parisian school, there was established a school of commerce in conuection with

the *königlichen polytechnischen Institutes* at Vienna. This department still forms a part of the institute, and will be noticed under the polytechnic head.

But the most important school of commerce in Austria is the Commercial Academy of Vienna, *(Wiener Handelsacademie,)* founded in 1857, an institution of which also I am enabled to speak from personal acquaintance. The fund of $168,000 with which it was established was raised by subscription; and still other sums have been since added in aid of the enterprise until now, in a new and beautiful part of the city, and provided with technological collections of much value, a museum of raw materials and manufactured articles found in commerce, and with a finely-equipped chemical laboratory for the analysis of commodities, it stands a magnificent monument of the intelligence, enterprise, and liberality of the imperial city.

The academy is under the control of a board of management, *(Verwaltungsrath,)* consisting of a president, vice-president, and seven other members. The principal is known as director. The faculty consists of twenty full professors and three instructors in stenography and drawing.

The course of study is given in two divisions of two-years' duration each, four years in all; the first being preparatory to the second division, which is more strictly professional.

To be admitted into the first yearly course of the preparatory division, the applicant must be at least fourteen years of age, and have completed the course of study given in the lower gymnasia of Austria. For admission to the second year's course of the preparatory division he must be fifteen years of age, with corresponding qualifications; for admission to the first year's course of the second division, the age of seventeen years is requisite; and to the last year's course, eighteen years of age, with a certificate of honorable discharge from the higher gymnasium, and the ability to pass an examination in all the branches taught in the first three years of the academic course.

The instruction in the first division embraces general and political arithmetic, physical geography, history of Austria and of the world, zoology, mineralogy, botany and physiology, calligraphy, preparation for book-keeping; German, French, and Italian languages. Having advanced thus far, the pupil is enabled to make an intelligent beginning of book-keeping of a more complex and difficult character; and, accordingly, with the advantage thus gained by a knowledge of the terms used in science and commerce, with some knowledge of values and a partial acquaintance with the languages in which much of his correspondence will require to be conducted, he enters upon study and commercial practice in the office, at the school, with fair opportunity to make the most of its facilities, as well as to understand the more difficult branches of commercial calculation, the relations of geography and statistics to commerce, commercial rights, exchange, the relations between the product-

ive industry of his country and its commerce, the principles of political economy, &c.; all of which, together with a continuation of the study of natural history, of the materiel of commerce, and its technology, and the addition of the English language, are to occupy him for the subsequent two years.

The price of tuition at the academy is about sixty dollars per annum, with a laboratory fee of two dollars extra. The number of pupils in attendance has steadily increased from 50, with which a commencement was made, until it has reached the figure of 500.

Besides the regular courses of instruction, an account of which has been given above, there has also been opened an evening course for such as cannot attend during the day. This continues from October 1 to Palm Sunday, the instruction being given by lectures and otherwise each evening in the week, Sundays excepted, from seven o'clock to nine o'clock. At the end of this course, to such as have been regular in attendance and have made good proficiency, certificates are given stating the facts. The evening course during the last year was attended by between 250 and 300 pupils, a majority of whom obtained the certificate.

Prussia presents, in addition to many commercial schools of the ordinary kind, a very interesting example of a novel class of schools in the case of the commercial and industrial school for young women, at Berlin. This school was opened in 1866, under the patronage of the association for the promotion among women of the capacity for gaining a livelihood, and was designed more especially for young ladies of the higher and middle classes ambitious of self-support. The institution presupposes a good degree of preliminary culture, and hence provides a quite extensive course of study almost exclusively professional.

There are, in fact, two courses provided—one of two years for such as desire as thorough culture as practicable for some pursuit strictly commercial, and the other of one year for those who desire a general knowledge of such business matters, especially including the management of a household, as ordinarily belong to the sphere of women.

Young ladies of properly certificated character and qualifications are admitted on paying a matriculation fee of three thalers, (of 75 cents each,) and the established rates of tuition, which, for the full professional course, are 50 thalers per annum, and for the short course, 60 thalers. Ladies who board in the institution pay from 200 to 250 thalers per annum, in addition to the fees for tuition.

The institution is also open to ladies who may wish to attend individual courses of study, or be present at certain lectures. Persons of this class pay one and one-half to two thalers per half year for each subject thus studied.

The regular courses are open to no student for a less period than one year.

The general subjects embraced in the courses of instruction are:

1. General study of commerce and industry, including definition of

commerce; different kinds of trade; auxiliary means of trade; coinage, weights, measures, money, banking, and exchange; the most important laws relative to commerce and industry.

2. Commercial and industrial book-keeping, (by single and double entry.)

3. Commercial correspondence in German.

4. Commercial penmanship.

5. General arithmetic, with calculations relative to commercial and industrial enterprises.

6. Elements of natural history, as auxiliary to commerce and domestic economy.

7. Elements of physics and chemistry, as related to commerce and domestic economy.

8. Physiology, more particularly in its relations to culinary affairs.

9. Knowledge of goods and technology.

10. Synoptical view of commercial geography and commercial history.

11. Studies connected with the usual vocations of women, especially the study of domestic economy.

12. German language and composition.

13. French language and correspondence.

14. English language and correspondence.

15. Drawing, more especially free-hand and pattern drawing.

16. Stenography, (optional.)

An elaboration of the above studies, as presented in the full programme, I do not deem important; but as the domestic economy section is an important one everywhere, and, as a branch of study, or rather department, demands especial attention I give this part of the course of study in detail.

1. Under the head of sustentation, the course in domestic economy embraces knowledge of alimentary substances, particularly the origin of various kinds of food, the amount of nutrition contained in each, their digestive qualities, their distinctive qualities, the adulterations to which they are liable, and the appropriate tests for their detection; animal food, including butchers' meat, poultry, fish, oysters, eggs, milk, butter, and cheese; vegetable food, including bread and flour stuffs, pulse, saccharine matters, garden vegetables, edible fruits, infusions, fermented drinks, salts, condiments; the most wholesome, most nutritious, and at the same time cheapest articles of food.

2. The preparation of food and drinks is considered under the following heads: The object of cooking; the kitchen as the physico-chemical laboratory of woman, its location, position, and arrangements; the hearth and its arrangements; fuel and fire; the cheapest materials for heating and lighting; kitchen utensils and the mode of using them; manner of testing utensils before purchase; water, hard and soft; rational boiling and roasting; Papin's pots; the most advantageous and speedy

methods of preparing meats, pulse, and other vegetables; toasting and baking; preparation of cold and hot drinks.

3. Preservation of food is subdivided in the following manner: Fermentation, spirituous, vinous, and putrid; causes of putrefaction and means of preventing it; hanging or drying; evaporation, boiling, and reboiling; preservation in hermetically sealed vessels; salting, smoking, pickling, preserving in sugar.

4. Knowledge of alimentary stuffs, and of household goods and materials, in connection with the instruction in the knowledge of commercial goods, illustrated by specimens in the museum of the school.

5. The study of various domestic functions, such as the care of furniture, bedding, and house-linen; sanitary laws; nursing of the sick; treatment and management of servants; keeping of family accounts.

The number of ladies receiving instruction in this institution the first year of its opening was forty-nine, and the growing interest manifested in the enterprise indicates that its accommodations will very soon require to be enlarged.

The example set by Berlin in the establishment of this remarkable institution appears to me most worthy of attention and imitation by every large city in the world. Nor is there room for question whether many of the subjects taught in both the commercial and domestic economy sections of the school could, with great advantage to both individuals and households, be introduced as essential parts of the courses of study in the schools for young ladies everywhere.

BELGIUM.

The Superior Institute of Commerce at Anvers, in Belgium, is another notable example of the recently founded schools for commercial instruction, and presents some peculiar features which render it especially worthy of notice in this place.

It was established in 1852, by the government of Belgium, in concurrence with the municipal government of the city where located, and has since undergone successive improvements, under ministerial decrees, until it now appears very fully to meet the desires of the government and the commercial community.

The price of matriculation in this school is five dollars, payable annually, after which the applicant for admission to what is called the general course is examined by a board, members of which are named by the minister of the interior, and presided over by the director of the institute, in the professional branches taught in the atheneums of the kingdom, as well as in the preparatory course of the institute; the only exceptions being in favor of candidates who have either completed their first professional year in an atheneum, or have obtained a certificate of *primus* in any German gymnasium; provided they possess a sufficient knowledge of the French, which is the language of the institute, and of two other languages. The tuition for this general course, the duration of which is one year, is $50.

Admission to the instruction given in the special course is only granted to those who have obtained the title of pupil of the second year, and have passed an examination in the branches taught during the first year. The fee for this course also is $50.

Persons wishing to take separate courses can do so without examination, on payment of eight dollars for the first course and four dollars in case of the renewal of their inscription in the same department. Such pupils, however, receive no diploma. For the convenience of persons not sufficiently instructed in science and modern languages at the literary schools, as well as of foreigners who need first to acquire a better knowledge of the French language, in which the instruction is given, and some preliminary acquaintance with the other languages spoken in the counting-rooms of the school, a preparatory course, similar to that in the *Handelsacademie* of Vienna, has been established, in which the studies taught are the following: The French, German, and English languages; history and geography; arithmetic, algebra, and geometry; chemistry, physics; book-keeping and writing.

The course of instruction in the institute proper embraces two years, and is both theoretical and practical, the branches taught being as follows:

Theoretical division: General history of commerce and industry; commercial and industrial geography; political economy and statistics; general principles of law; comparison of commercial and maritime rights, and the principles of international law in their relations to commerce; the customs and laws of Belgium, and the other principal countries; study of constructions and maritime armaments.

Practical division: Commercial affairs and banking; accounts and the management of books, correspondence, &c., in the practical bureau of the institute; study of natural productions and of merchandise; correspondence in the German, English, Spanish and Italian languages.

The lessons in the theoretical department are principally by lectures, the students taking notes and undergoing subsequent examination upon the subject-matter. In the bureau of the institute the instruction is more individual and personal, and all the transactions between the pupils in their capacities as merchants are conducted in the languages of the countries which they respectively represent.

The hours of study in the practical division are during the usual banking hours, and the lectures take place in the morning, afternoon, and evening, so that they may be attended by business citizens and young men looking to the mercantile profession, but failing of the time or means of a regular course.

The instruction is given by eight full professors, two assistants, and three under-chiefs of the bureau, and is well supported by numerous collections like those already mentioned in my notices of the French and Austrian schools.

Graduation takes place after a satisfactory examination before a com-

mission appointed by the minister of the interior, and the diploma awarded states whether the graduation was "with credit," "with distinction," "with great distinction," or "with the greatest distinction." Such as attain diplomas of highest distinction may receive a bursary for travel in foreign lands. The government granted this favor to three pupils in 1864, to enable them to improve their commercial knowledge in the West Indies, in Mexico, and in the Asiatic ports; and since that time five others have been subsidized in like manner—two for travel in the United States and Mexico, and three, with the title of pupil consul, for temporary study in foreign commercial cities.

Whether viewed as individual schools eminently useful in the countries where found, or as the representatives of a class of institutions long demanded by the interests of commerce everywhere, and now growing up in many lands, they constitute a very interesting feature of the educational movement of the present century. I have been thus particular in reporting them, because of the importance to this country of a better public appreciation of what, in this same direction, our own commercial and financial interests require.

II.—NAVAL AND MILITARY SCHOOLS.

In view of the great importance of this branch of education, not merely as a general question, but in its relations to the interests of this country, I had desired and intended to present, in some form for public use, a full and systematic comparison of the regulations governing military education in the leading countries of Europe; and to this end had made special visits to the superior military schools of England, France, Italy, Austria, Prussia, and Russia. In consideration, however, of the very able manner in which the more vital points it was my design to illustrate have been already presented to our country and government by some of its ablest educational and military men, and especially as it seems imperative that this report, already carried in volume beyond the limit of my intent, should be curtailed, I have determined to confine the military section chiefly to conclusions.

Concerning the proper age for introducing young men to the study and discipline of military schools, we have, in the United States, long been very seriously, and to some extent are still at fault. While the leading governments of the Old World, after an experience many times longer in duration than the whole period of our national existence, have, one by one, increased the minimum required of candidates for position in their naval schools from twelve to fourteen and sixteen years, and of candidates for cadetships in the military academies from fourteen to eighteen, (the minimum lately required by England,) we are still maintaining the minimum for those two classes of candidates at fourteen and sixteen respectively, and doing so in the face of what are demonstrable, on philosophic grounds, as the best interests of both pupils

and service, and regardless of the greatly improved results obtained by those governments which have raised the minima in recent years.

In regard to natural endowments, our system has been no less faulty; providing, as it does, merely against serious physical deformity and disease, and not at all for that clearness, vigor, and aptitude of mind, and for those high moral qualities, all of which are indispensable to the highest power and success of the soldier destined for the command of men, whether on the sea, in the garrison, or on the field.

Touching the educational qualifications demanded of candidates for admission to our military schools, the prescription of mere ability to read and write, and perform with facility the various operations of the ground rules of arithmetic, of reduction, of simple and compound proportion, and of vulgar fractions, it is hardly possible to use milder language than that such conditions are an injustice to the intelligence of our people, and a disgrace to both people and government. The days of 1812 are past, and we are no longer "a few people in the wild woods of North America."

On this head I cannot forbear making comparison of our standard with those of two or three of the European powers.

AUSTRIA.

In Austria, whose rank is not that of a first-class military power, instead of one single institution, like our West Point Academy, there are three general classes of schools, each variously subdivided, and some of the subdivisions embracing numerous schools.

The three general classes are:

1. Institutions designed for the education of pupils as non-commissioned officers—including 10 "lower military houses of education," 10 "upper military houses," and 20 "school companies."

2. Institutions designed for the education of pupils as officers—including the "cadet schools," of which there are four, with 200 pupils each, and "military academies," of which there are also four.

3. Perfecting and special military educational institutions—including a "military normal school," the "higher course for the artillery and engineers," and the war or staff school.

Of the several schools, the military academies included in the second class demand attention in this connection, their object being to educate officers in the higher military subjects for the different arms of the service. They are the Neustadt Academy, the Artillery Academy, the Engineers' Academy, and the Marine Academy.

In the Neustadt Academy, which corresponds in general character to our own, being designed to qualify pupils for the more general service, the educational qualifications for admission are the ability to pass a thorough examination in the German language, including the rules and art of correct speaking, prosody, and rhetoric; natural history, botany, zoology, and geology; French language—translations from French into

German, and German into French; geography, history, geometry, plane trigonometry, with the applications of algebra and the solution of geometrical problems, and drawing.

The course of study in the academy, with these qualifications for entrance upon it, occupies four years, and includes theology, French, Italian, Bohemian, and Hungarian; logic and psychology; physical geography; history; analytical geometry, and higher mathematical analysis; mechanics, with spherical trigonometry; mathematical geography and triangulation; natural philosophy; chemistry; practical mensuration, and sketching maps at sight; descriptive geometry; military composition; actual international law; Austrian civil law; military penal law and mode of procedure; pioneer service, with field fortifications; permanent fortifications; civil architecture; arms and munitions; study of ground and positions, and military drawing; army rules and regulations, and military administration; rules of infantry drill and exercise; rules of cavalry drill and exercise; maneuvering; riding, gymnastics, fencing, dancing, and swimming.

After the completion of this course of study, the thoroughness of which in the manner of teaching is certainly excelled nowhere in this country, the pupils are recommended by the war department to the Emperor for nomination as second lieutenants of the second class.

PRUSSIA AND RUSSIA.

In Prussia and Russia, the systems of military education being no less complete and thorough, the standard is equally high, and in some respects more advanced.

GREAT BRITAIN.

In England, long the really strongest military power, the educational qualifications for admission to the Royal Military Academy at Woolwich are even higher than those above given as being demanded by Austria, to wit: A knowledge of simple and practical mathematics; English literature; geography and history; Greek and Latin classics; French language and literature; German language and literature; chemistry and physics; mineralogy and geology; geometrical and landscape drawing—a degree of preparation about equal, if not superior, to that implied by our bachelor's diploma.

On the 23d day of June, 1868, the Queen appointed a commission to inquire into the present state of military education in the United Kingdom, and more especially into the training of candidates for commissions in the army, and into the constitution, system of education and discipline of the Royal Military Academy at Woolwich and of the Royal Military College at Sandhurst, as well as into the rules and regulations under which candidates are admitted into those colleges.

This commission have recently made their first report, (Blue Book No.

22,357, 1869,) from which the following statement of the number and organization of the institutions for military instruction is extracted:

"At present the professional education of officers of the British army, both before and after they have joined the service, is under the control of a council of military education. This body was instituted in 1857. It is composed of five members, of whom one is a civilian. They are appointed on the recommendation of the commander-in-chief, with the concurrence of the secretary of state for war, the commander-in-chief himself being *ex officio* president. The council advises the commander-in-chief on all subjects connected with military education. It supervises the various state establishments of military instruction; it appoints examiners, and regulates the educational conditions under which direct commissions are distributed.

"The present organization, under the direction of government, for the general administration of instruction in military subjects comprises the following institutions:

"The Royal Military Academy at Woolwich.

"The Royal Military College at Sandhurst.

"The Royal Engineer Establishment at Chatham.

"The Department of Artillery Studies at Woolwich.

"The Advanced Class of Artillery Officers.

"The School of Gunnery at Shoeburyness.

"The Repository at Woolwich, a branch of the School of Gunnery.

"The Staff College at Sandhurst.

"The Survey Class at Aldershot.

"The School of Musketry at Hythe.[1]

"Of these institutions the Engineer Establishment, the School of Gunnery, the Repository, and the School of Musketry, are not under the direction of the council of military education. The three former are of a purely regimental character, and are conducted by regimental officers.

"As subsidiary to these establishments there may be reckoned the examination systems which have been introduced for the purpose of ascertaining the general educational fitness of all officers who obtain a direct commission, as well as the professional competence of those who are promoted to the ranks of lieutenant and captain.

"Of the institutions above enumerated the Royal Military Academy at Woolwich, and the Royal Military College at Sandhurst, are the only establishments under government which exist for the purpose of giving a special education to young men before they enter the army.

"The Royal Military Academy at Woolwich is devoted solely to the instruction and training of candidates for the artillery and engineers, and a course of instruction at the academy is a necessary qualification for admission to these corps.

"The number of cadets under instruction at the Royal Military

[1] The inquiry did not extend to the School of Musketry, as that institution is one intimately connected with the training of the rank and file of the army.

Academy averages about two hundred. Admission is obtained by open competition, but the candidate must be between sixteen and nineteen years of age.

"The subjects of the examination for admission embrace mathematics, classics, English language and composition, English history, modern geography, French, German, Hindoostanee, experimental sciences, natural sciences, and drawing. In the marks assigned to the various subjects a considerable preponderance is given to mathematics and classics, especially to the former.

"A candidate can only compete in five subjects, of which mathematics must be one. The others may be chosen by himself. In order to qualify, however, every candidate must attain a certain standard of proficiency in the lower branches of mathematics, (arithmetic, algebra, Euclid, and plane trigonometry,) in geometrical drawing, and in either French, German, or Hindoostanee.

"The cadets remain two years and a half under instruction, during which period the course of study is almost entirely of a professional character. Examinations are held half-yearly, which determine the promotion of the cadets from class to class. At the end of the course the first class undergo a final competitive examination, which regulates the order in which they receive their commissions. A certain number of those who stand highest on the list are allowed to enter the engineers, if they prefer doing so, the remainder receiving commissions in the artillery.

"The discipline of the academy is intrusted to a lieutenant-governor, assisted, except during the hours of study, by a staff of military officers, who conduct the drills and exercises, but have nothing to do with the rest of the instruction. This is conveyed by a body of professors and masters, who are composed partly of military officers and partly of civilians.

"The Royal Military College at Sandhurst is maintained for the purpose of educating a limited number of young men about the cavalry, guards, and line; to the most distinguished among whom commissions without purchase, to the number of about eighty, are annually granted.

"The limit of age for admission to the college, except in the special case of students of the universities, is from sixteen to nineteen. All candidates are nominated by the commander-in-chief and then admitted to a competitive examination held half-yearly, with the exception of twenty young men known as the Queen's cadets, the sons of officers of the army, navy, or marines, who have died on service and have left their families in reduced circumstances, to whom direct admissions are given by the secretary of state for war, and of a similar number of Indian cadets, the sons of persons who have served in India in the military or civil services of her Majesty or of the East India Company, who are nominated, without any restriction, by the secretary of state for India. From these two last classes of candidates only a qualifying examination is required.

"The examination is of the same general character as for admission to Woolwich, but the actual subjects and the allotment of marks are somewhat different. Mathematics and classics are placed on the same footing, and the number assigned to each is treble that allotted to any other subject. There are in all nine subjects of examination, but a candidate can only take up five. In two of the subjects, viz., in mathematics (arithmetic, algebra up to simple equations, and the first three books of Euclid) and in the English language and composition, a fixed minimum qualification is obligatory on every candidate. Of the remaining subjects any three may be chosen. As it generally happens that there are vacancies enough in the college for all the candidates who qualify, there is practically no competition for admission.

"The course of study at the college lasts, under ordinary circumstances, for eighteen months. The subjects taught are mostly of a professional nature, comprising mathematics, fortification, military sketching, military history, French, German, chemistry, geology, and landscape drawing.

"At the conclusion of the course the cadets pass through a competitive examination. A certain number of commissions without purchase are awarded to those who stand highest in order of merit; the remainder, provided they obtain the necessary minimum number of marks, are qualified for commissions by purchase, and have prior claims for such commissions over all candidates who have not passed through the college. The Queen's and Indian cadets obtain commissions without purchase on merely passing the qualifying examination.

"The constitution of Sandhurst is, in its general features, similar to that of Woolwich; the duties of enforcing discipline out of study hours and of imparting instruction are in separate hands, the former functions being confined almost entirely to the military staff of the college, who form a body quite distinct from the professors and instructors.

"Both at Sandhurst and Woolwich an essentially military character is given to the educational system. The cadets wear uniforms; drill, gymnastic exercises, and riding form an important portion of their training; they are subjected to a form of military discipline, and the punishments inflicted are of a military character.

"The payments required from cadets at Sandhurst and at Woolwich are also regulated on the same principle of a graduated scale. The charge for the sons of private gentlemen is, however, less at Sandhurst, being only £100 a year, as against £125 a year at Woolwich. Queen's and Indian cadets at Sandhurst not only receive a free education, but are provided with uniform and certain fixed allowances at the public expense.

"The only other educational organization affecting the young officer before he joins the service consists of a system of examinations for direct commissions by purchase. At stated intervals examinations are held at Chelsea, under the superintendence of the council of military

education, which candidates nominated to a commission by purchase are required to pass.

"The limits of age are as follows: From 17 to 20 for the infantry; from 17 to 22 for the cavalry; from 17 to 26 for the colonial corps.

"The subjects of examination, the allotment of marks, and the conditions required for qualification, are almost identical with those adopted at the examination for admission to Sandhurst. The successful candidates are arranged in order of merit, and, as a general rule, are commissioned according to the place they occupy in the examination lists.

"Students of the universities who have passed the examinations necessary for a degree become, *ipso facto*, qualified for commissions by purchase, and in their case the limits of age are extended to twenty-three years for the infantry, to twenty-five for the cavalry, and to twenty-eight for the colonial corps."

FRANCE.

In France the candidate for admission to the *École Impériale Speciale Militaire*, at Saint Cyr, which institution is designed to form officers for the infantry, cavalry, *corps d'état-major*, and infantry of marine, must present his diploma of bachelor of science, or, at least, of letters, and undergo two examinations, the first in the department where the candidate resides, or may be stationed, if a member of the army, and the second on arriving at the institution, as follows:

1. Compositions in writing, embracing a Latin translation, a French composition, and a logarithmic calculation; the drawing of a plan in descriptive geometry; the sketch of an academy.

2. Oral examinations in arithmetic, algebra, geometry, descriptive geometry, trigonometry, (plane,) mechanics, cosmography, physical geography, history, and some living language other than French.

Besides these general schools of military science there are, as in Austria, Prussia, England, Italy, Russia, and other European countries, special schools for different arms of the service, in all of which, as well as in the naval schools, a grade of qualifications correspondingly high is demanded.

But even the foregoing account does not fully show the real qualifications possessed by those candidates who gain admission, for the reason that the examinations are not made there, as here, in an easy, generous way, regardful of the feelings of candidates and family friends, but, in nearly all countries, are public and competitive.

In our academies the number of places is limited to one for each congressional district, in the Military Academy, and two for each district in the Naval Academy; and there are no other national military schools. There can be no question, therefore, that if the standard were made very high, as high as in England or France, and the places were offered to those who, in competitive examinations before competent authorities, should prove themselves naturally and by education best qualified to fill

them, these schools would be sure of a vastly better class of pupils in every respect, and the country of more worthy and competent officers in time of need.

In most European countries the cadet pays the government large fees for instruction, while in the United States they are not only educated but supported and paid by the government from the day of their admission. And yet statistical tables, published by authority of the government, show that almost fifty per cent. of those who are appointed fail to complete the course of study prescribed.

If in aristocratic England and the other more despotic countries of the Old World they have deemed it essential to the maintenance of high position as military powers that the best endowed and best trained of their youth, the very flower of their young men of genius, should rise to the command of their troops and their marines, and so have resolutely laid the axe at the root of privilege, by offering its highest rewards to such as demonstrate their title to them from whatever class they may come, is it not time that we also, in democratic America, abolish the system of favoritism by which appointments are made to our schools of the army and navy?

CHAPTER IX.

POLYTECHNIC SCHOOLS.

Rapid development of polytechnic education in all countries—Imperial Polytechnic School of France—Austria, Prague, Brunn, Gratz—Royal Institute at Vienna—Prussia, Academy at Berlin—Grand Duchy of Baden, School at Carlsruhe—Bavarian schools at Munich and other places—Hanover—Saxony—Swiss Federal School at Zurich—Italian schools of technical science—Scandinavian schools at Copenhagen and Stockholm—Russia—Royal School at Stuttgart, Wurtemberg—Other continental polytechnic schools—Great Britain—General account of technical schools in the United States—Massachusetts Institute of Technology.

The estimation in which polytechnic schools are held in Europe is evidenced by the munificence of governments, associations, and individuals in their establishment, equipment, and endowment. Wherever found, whether in France, where they had origin; in Switzerland, where within a very few years they have had their most remarkable development; in Baden, Wurtemberg, and Bavaria, where, next after the primary schools, they are considered the prime necessity; in Italy, where they are beginning to be appreciated and where the way for their establishment has been paved by the *scuole tecniche*, of which the number is great in that kingdom; in Austria, where at present they hold high rank and are steadily gaining in favor; in Saxony and all portions of enlarged Prussia, where they are making rapid growth and approach more and more nearly, in public estimation, to an equality in rank with the literary institutions; in Scandinavia, where they are recognized as the great desideratum of the present times; in Russia and its dependencies, where instruction in the sciences and their professional applications is deemed the *sine qua non* of their advancing civilization—in short, wherever this new mighty power we call science has forced its way into recognition, there do we find that the most extensive and most magnificent educational institutions are such as have been erected in the interest of science and the industrial arts. No other class of institutions in the world can boast of such splendid edifices, vieing with, and in some cases even excelling, in extent and architectural beauty, the renowned palaces of kings. None are favored with such vast mineralogical, physical, chemical, philosophical, and even art collections and laboratories for illustration and experiment, and none rejoice in abler faculties or more numerous, intellectual, and enthusiastic bodies of students.

Even in Finland, and within the walls of the Royal University, (at Helsingfors,) I have found the fires of this new enthusiasm for science brightly burning. The already extensive buildings devoted to chemistry, natural history, and natural philosophy are no longer felt to be

adequate, and to-day a new edifice, more extensive than any university building in America, is rising to its third story, for the better accommodation of what is to be the polytechnic department of the flourishing Finnish University.

Naturally, the details of organization are somewhat different in the different countries where schools of this class exist; nevertheless, their main features are everywhere the same, and the title of polytechnic, by which they are almost universally known, is generally expressive of their objects and character, as schools for instruction in many arts, though, in at least one notable instance, (reference is made to the Polytechnic School at Paris,) the correspondence in the general scope of the instruction is nearer to the type of the American scientific schools, to which reference has just been made in another place.

IMPERIAL POLYTECHNIC SCHOOL OF FRANCE.

This famous institution was established by the National Convention of France, in the year 1794, at the instance of Carnot, Fourcroy, and other leading men of that time, under the more really descriptive title of Central School of Public Works. The following year the name was changed to Polytechnic School of France. Its present title is Imperial Polytechnic School, *(École Impériale Polytechnique.)* Its unlikeness to most of the other polytechnic schools of Europe and its resemblance to schools of general science consist in the fact that its courses of instruction are not directly connected with the practical arts, its office being rather to prepare the pupil to enter either the general service of the government, should he desire to do so, or to enter special or professional schools, where the direct applications of general science are taught.

Under the present arrangement for the partition of the public institutions among the imperial ministers, the polytechnic school is under the control of the minister of war, by whose courtesy I was several times privileged to examine into its condition and mode of management.

Its declared object is to prepare pupils for the following public services: the artillery service on land and sea, military and maritime engineering, the imperial marine, the corps of hydrographic engineers, the commissariat of the navy, the department of bridges, highways, and mines, the corps of *état-major*, the manufactures of the state, the department of the telegraph, and, finally, for other public services which demand an extensive acquaintance with the mathematical, physical, and chemical sciences, and which may be added by future decree to the branches of public service above specified.

The organization of the institution is such as to secure efficient management and the admission of such pupils only as are likely to prove valuable acquisitions to the public service.

The institution is wholly under a military *régime*, and the chief officer of the school is known as the commandant. Subordinate to him, and in immediate charge of all matters of instruction, is the director of studies,

who is appointed by imperial authority, and who, together with the commandant, the professors, a representative of the subordinate teachers, and the secretary, constitute a council of instruction, whose duty it is to have stated meetings for the consideration of matters within their spheres of labor and to refer all matters requiring further attention and decision to the Council of Improvement, consisting of the director, a certain number of examiners, members of the Academy of Sciences, and officers representing the different branches of public service preparation for which is the object of the school.

Admission is granted only after a series of the most rigid examinations, first, in the several districts of the empire to which, on the nomination of the Council of Instruction, four or more competent persons are deputed for that purpose at certain stated times by the minister of war; and, secondly, by a board of examiners at Paris.

In order to be admitted to the examination, candidates are required to show that they are of French birth or have been naturalized; that they have attained the age of sixteen years and were not over twenty on the first of January of the year of the examination; and that they have received the diploma of bachelor of science or of letters. Military candidates from the army corps are admitted exceptionally to the examinations up to the age of twenty-five, on showing that, by the first of January next succeeding, they will have completed two years of service under the flag of the empire. They can only be assigned to the military service, however, on completing their studies.

Civil candidates must enroll themselves as such with the prefect of the department of the empire where they studied; military candidates, at the prefecture of the department in which they are garrisoned. Non-military candidates may be examined either within the district where their families reside or within that which embraces the place of their preliminary study. Military candidates must undergo examination at the places assigned for the examinations in the particular department in which their army corps is in garrison.

The documents necessary for the inscription at the prefecture are, first, proof of requisite age; secondly, a duly legalized declaration, by a physician or surgeon connected with some military or civil hospital, to the effect that the candidate has had the varioloid or that he has been vaccinated, and that he has no contagious disease or physical infirmity that would unfit him for the public service; thirdly, the diploma of bachelor of science or of letters, or a document showing his title to one; fourthly, a written declaration of the place of examination chosen by him or his family.

The examinations for admission are both written and oral, and no candidate can be admitted to the oral examinations unless he has first passed the written examinations in a satisfactory manner. There are also two degrees of oral examination. Examinations of the first degree serve to establish whether the candidate has sufficient qualifications to

entitle him to an examination of the second degree. Examinations of the second degree determine the classification in order of merit of those admitted to the final examinations. Candidates who have been successful at the first general ordeal are admitted in order of rank, according to the registers of the examiners, made with reference to a definite scale, and, from the number of successful candidates reported, the board of final examination, consisting of the commandant, director, and regular examiners of the school, together with the original examiners of the candidates, then select such as, at this competitive trial, prove themselves most competent in all respects to fill the existing vacancies.

The examinations are in arithmetic, geometry, algebra, plane trigonometry, analytical geometry, descriptive geometry, physics, chemistry, French language, and design, conformably to official programmes adopted by the minister. Candidates may also present evidence, by thesis and translation, of an acquaintance with any one of the five following languages, to wit: German, English, Italian, Spanish, or Arabic.

The written compositions required of candidates must bear upon each of the scientific branches of which a knowledge is required, and must include, moreover, a French composition, a plan in descriptive geometry, a colored and a crayon design.

The full term of study is two years; price of boarding and lodging, 1,000 francs ($200) per annum; cost of wardrobe about 600 francs. For the benefit of poor young men of merit some twenty or more gratuities (bursaries) and half-gratuities, as well as outfits and half-outfits, or trousseaux, are granted each year by the minister of war, on the recommendation of the two councils of the schools—the council of instruction and the council of administration.

Students of the school are divided into two sections, corresponding to the two years duration of the term of study; and no pupil can pass from the first section into the second until a satisfactory examination has been passed in all the studies of the first year; nor can any pupil remain in the same section more than two years, or in the school more than three.

The courses of instruction belonging to the first year embrace differential and integral calculus, statics and dynamics, problems in physical astronomy, problems in descriptive geometry relating to the right line and plane, tangent planes and normals to plane surfaces, &c.; applications of analysis to geometry, elements of machinery of various kinds, general physics, including the properties of bodies, the principles of equilibrium of fluids, constitution of the atmosphere, &c.; general chemistry, the general principles of architecture, essays and other exercises in the French language, elements of the German language, and topographical drawing.

The second year is devoted to the continuation and completion of mathematical analysis, and the study of forces applied to an invariable system, the principle of virtual velocities, hydrostatics and hydro-

dynamics, applications of geometry to problems with a single plane of projection, linear perspective, shadows, &c.; astronomy and geodesy in their various branches, elements of the calculation of probabilities, (applicable to insurance, &c.,) electricity, magnetism, acoustics, and optics; the conclusion of inorganic chemistry, including the methods of extracting metals from their ores; organic chemistry, architecture, French composition, German themes and translations, topographical landscape and figure drawing.

The instruction in the theoretical branches is chiefly given by conversational lectures and by frequent interrogations by the professors and repeaters. Formerly pupil teachers were employed, but now the assistants, known as repeaters, perform the service once assigned to them, and to a still greater extent relieve the professors. During the interrogations a careful record is made of the general correctness of answers made by the several pupils, and at stated times these records are reported to the director.

At the end of the full period of study there are thorough examinations on all the branches taught; each pupil being examined singly and alone, and credited on each branch according to his proficiency therein; and then the board of examiners, on comparing notes, and according merit for proficiency in the several branches in the order following, to wit, first, mathematics; secondly, topographical and other drawing; thirdly, geometry (descriptive) and geodesy; fourthly, physics and chemistry, determine who shall be entitled to graduation. Such students as have passed the examinations with the most credit, and hence stand first on the list, are then permitted to choose the particular branch of the public service they will enter. Should any graduate from highest in merit to lowest choose a branch of the service in which there are no vacancies, he still has priority over all below him in making successive choices until a vacancy be found.

In some departments of the service graduates of the polytechnic school are received at once, in subordinate positions, as apprentices, for a term of three or more years; but admission to the most of the departments of service can only be gained after still another course of study in a special school, continuing from two to four years.

In giving the foregoing account I have been thus particular, in order that the great care with which, in France, the avenues to positions of responsibility are guarded by regulations that test capacity and determine fitness, might the more fully appear.

The polytechnic schools of all other countries more strictly conform to the idea conveyed in the title they bear; and yet none of them are solely polytechnic, if we use that word in its etymological sense, since all embrace a preliminary course of instruction in general science of from one to two years in duration; thus combining in one institution what the Imperial Polytechnic School of France would embrace if it included all the several technical and professional schools to which it

really stands, as before remarked, in the relation of a high preparatory school.

AUSTRIA.

The polytechnic schools of Austria are next in order of time and likewise hold high rank. The first established was the Technical Institute at Prague, founded in 1806, which embraced a two years' preparatory and a three years' technical course of instruction. Since that date, others have sprung up, and, at present, besides four, which are extensive and prominent—at Prague, Vienna, Gratz, and Brunn—there are several less important ones in the various provinces.

Of the polytechnic schools proper, it was my privilege to visit all except the one at Brunn. Pre-eminent among them, and therefore entitled to represent them as a class, stands the school at Vienna, one of the noblest and most useful in Europe.

The Royal Polytechnic Institute at Vienna was founded in 1815, and has always enjoyed the favor of government and people. The magnificent buildings recently constructed for its use occupy a most eligible position in the heart of the city, and are admirably adapted to its uses; including, besides the large number of apartments necessary for study, practical exercises and lectures, a series of extensive, well-furnished, and well-equipped laboratories, cabinets, &c., for the use of professors and students. Formerly there were also connected with the institute extensive workshops, in which geodetic and astronomical instruments of high repute were manufactured for sale throughout the empire and to other parts of the world. Under the present organization, however, the shops are solely for instructional use.

The school embraces two general divisions—the technical and the commercial—besides a preparatory department, and is presided over by a rector, assisted by a pro-rector.

The technical division embraces four special courses or schools, to wit: The school of engineering, the school of architecture, the machinist's school, (*Maschinenbauschule*,) and the school of technical chemistry.

The duration of the preparatory course is two years for students designing to enter either of the three first-named schools; but pupils preparing for the school of chemistry may pass from the preparatory school at the end of the first year.

The conditions of admission require of the applicant for entrance into the preparatory school evidence of preliminary study and due proficiency and of moral character. Admission to the technical schools can only be granted to persons at least sixteen years of age and of certificated moral character, who either are possessed of certificates showing that they have completed a full course in a gymnasium or real-school, or are found capable of passing an examination showing equivalent attainments. They must also furnish guarantees that they will promptly pay all dues for tuition and incidental expenses.

The matriculation fee to be paid by students of all classes is 4 florins

20 kreuzer, (about \$2;) tuition, per half-year, in either division of the school, 12 florins 60 kreuzer, (\$6 50;) for facilities in the laboratories, 10 florins to 20 florins extra.

Extraordinary students—persons not wishing to take a full course, simply to attend certain lectures or courses for a limited time—are admitted on terms made by the several professors whose instruction they wish to attend.

The school-year begins October 1 and ends August 1.

The instruction embraces lectures, practical exercises in the various laboratories, and excursions, and is given by the rector, pro-rector, the principals of the several schools, 19 public ordinary professors, 4 public extraordinary professors, 6 private teachers, (*Privat-docenten*,) 7 instructors, 3 extraordinary instructors, 6 adjuncts, and 11 assistants.

The studies included in the preparatory school for the two years are as follows:

First year. Algebraic analysis; analytical geometry; elements of differential and integral calculus; descriptive geometry; construction drawing; inorganic chemistry; principles of botany; practical botany; technical and free-hand drawing.

Second year. Differential and integral calculus completed; general physics; technical mechanics; practical geometry; topographical drawing; construction exercises based on descriptive geometry; technical and free-hand drawing.

The duration of the full course in the school of engineering is three years, and includes the following branches of study:

First year. Technical physics; general knowledge of machinery, (*Maschinenkunde;*) architecture; architectural exercises; geology and geological exercises; the mechanics of architecture; ornamental drawing.

Second year. Analytical mechanics; geodesy; hydrography; exercises in construction; bridge-building; topographical drawing.

Third year. Construction of roads and railways; exercises in construction; history of architecture.

The full course in the school of architecture embraces two years. The following are the branches taught:

First year. Architectural construction and architectural exercises; general study of machinery used in practical architecture; theory of architectural construction; ornamental drawing.

Second year. Architecture as a fine art; exercises in architectural drawing; history of architecture; ornamenal drawing and modeling.

The school for machinists likewise embraces two years—

First year. Analytical mechanics; study of machinery; machine construction; exercises in constructions; mechanical technology; technical physics.

Second year. A second course in the study of machinery; second course in machine construction; construction exercises and designing and sketching.

The school of technical chemistry embraces three courses of a year each—

First year. Organic chemistry; analytical chemistry; work in the laboratory; general physics; technical mechanics.

Second year. Chemical technology; work in the laboratory; technical physics; general study of machinery; knowledge of articles of merchandise, (*Waarenkunde*,) and the adulterations to which they are subject.

Third year. Work in the laboratory; mechanical technology; geology (second course;) geological exercises.

The commercial school embraces a two-years' course of study of the following subjects: Book-keeping by single and double entry; commercial arithmetic; the science of trade; commercial correspondence; merchandise, or the materials of trade and the impositions practiced in the various branches of manufacture; the laws of Austria regarding trade, exchange, insurance, &c.; commercial geography; statistics of the European states; and commercial history.

Instruction is given, by several professors, in French, English, Italian, Persian, and Turkish languages, and in Vulgar-Arabic, but the study of none of them is included as an essential part of the regular courses.

Regular and extraordinary lectures are likewise given on the German classics, æsthetics, political economy, agriculture, and many other subjects, which such of the pupils as are able to do so are encouraged to attend.

On the completion of any of the full courses of study, such students as undergo a satisfactory examination receive the diploma appropriate to the several departments in which they have studied. Students not taking a full course may be examined and receive such certificate as their attainments entitle them to.

During the year 1867 there were, in the aggregate, nearly a thousand students in attendance upon this institute.

PRUSSIA.

Polytechnic education in Prussia is furnished to an extent commensurate with the zeal and enterprise of that country, but, except such as have become Prussian by recent absorption, like the one at Hanover, they all bear other titles than polytechnic. Among the most important of them is the Royal Industrial (*Gewerbe*) Academy at Berlin, founded in 1821.

This institution was designed to furnish thorough instruction in the applications of science to the mechanical arts, (including especially architecture, machine-building, and ship-building,) and in chemical technology and mining.

Each general department embraces two divisions, the course of study in each division occupying one and a half year. Instruction in the first division is largely or entirely theoretical; in the second, largely practical.

The institution is under the general direction of the minister of com-

merce, industry, and public works, the more immediate management being intrusted to a college of trustees consisting of one officer of the ministry, the director of the academy, two professors, and two other scientific persons not connected with the school.

The annual appropriations made by the state amount to from $40,000 to $45,000, and tuition is merely nominal.

The terms of admission require that the applicant shall be between the ages of seventeen and twenty-seven; that he shall present the usual certificates of moral character, as well as a certificate showing that he has creditably completed a full course of study in a gymnasium, real-school, or provincial industrial school; and, in the case of persons intending to qualify for ship-building, that they have spent one year practically at work in a ship-yard, and that they intend to make ship-building their profession.

Students regularly entering for the whole course must pass through the first division before entering the second, except in the case of students in the chemical department, who are sometimes admitted to the last course after one year's study in the first. Choice of studies is permitted to all except stipendiaries, of whom there are forty or fifty.

Machinists are permitted, after completing the full course of study, to remain one year longer at work in the shops.

In the magnificent buildings provided for the academy there are not only extensive collections, essential to the departments of natural history and physics, as well as superior chemical and technical and even photographic laboratories, industrial collections, and workshops, but likewise a number of the most valuable collections of models in plaster, drawings, plans, and designs connected with architecture, engraving, &c., and with the ornamental arts, that I have found in any such institution in Europe.

The following scheme presents the general course of instruction running through the two divisions:

First division. General arithmetic, including high equations; spherical trigonometry and practical use of trigonometry; differential and integral calculus; statics and mechanics; theory of the mechanical effects of heat; descriptive geometry and its applications to perspective and to making plans for stone-cutting; general and organic chemistry; technical chemistry; general construction of buildings; study of the simple parts of machinery.

Second division. For architects and machinists especially: Theory of the strength and durability of materials; parts of machines and construction of machinery; calculations of complicated building constructions, and theory of the arch; measurement of water and air in artificial conduits; theory of warming and heating apparatus; general theory of machines, their durability and regulation, especially the theory of hydraulic motors and steam-engines; calculations of simple parts of machines; general relations of parts of machines; special mechanics,

power of machines; mechanical technology; chemistry; exercises in drawing parts of machinery; exercises in calculating and drawing power-machines; planning and drawing factory buildings; calculating and drawing such artistio forms as are used for iron castings; mathematical proofs of the principal laws of physics. For chemists and miners: Special inorganic chemistry; special organic chemistry; mineralogy; geognosy; metallurgic chemistry; chemical technology; special mechanics, power machines; exercises in planning and caloulating ohemical arrangements; laboratory practice. For ship-builders: Principal part of course required for architecture; drawing of ships and parts of ships; art of ship-building, (embracing general discussion, displacement and stability, and hydrostatic calculations;) study of stability, and theory of sail and steamships; general principles regarding the form of ships, and theory of the construction of wood and iron ships.

The above instruction was being given, in 1867, by 24 professors and practical instructors, to 500 students.

GRAND DUCHY OF BADEN.

The Grand Duchy of Baden Polytechnic School at Carlsruhe, founded in 1825, has long enjoyed the reputation of being the most extensive, complete, and thoroughly equipped of all the institutions of its class in Europe, and is therefore entitled to a liberal share of space in this portion of my report.

The main object of the institution is to educate engineers, machinists, architects, chemists, foresters, and agriculturists. Reference is also had to the preparation of such pupils as look to financial economy and positions of that kind in the state for their work. The institution is divided into the following departments: 1. The mathematical school. 2. The school for engineers. 3. The school for machine builders. 4. The school of architecture. 5. The chemical school. 6. The forestry school. 7. The agricultural school.

The instruction embraces lectures, repetitions, and examinations, graphic and constructive exercises, work in the laboratories and workshops, and excursions.

The means of illustration and practical teaching include a cabinet of natural philosophy; mineralogical and geological collections; zoological and botanical collections; collections of models belonging to the school of engineering; collections of models for tho school of machine-building; a collection of models for the school of architecture; technological collections; collection of geodetical instruments; collections illustrative for the department of descriptive geometry; collections of models, ornamental and practical, in plaster; collections belonging to the school of forestry; collections belonging to the agricultural school; and a large library of scientific, technical, and other works.

Besides which there are the following extensive laboratories: a chemical laboratory, one of the best for practice in Europe; a laboratory for

natural philosophy; a mineralogical laboratory; a forestry laboratory; and an agricultural laboratory.

The forestry and agricultural schools are provided with extensive grounds for illustration, practice, and experiment.

The workshops connected with the school, and essential to the scheme of instruction, are four in number, to wit, shops for making models in clay, plaster, and wood, and for the building of machines.

The organization of the school, as it exists at present, is based on a statute approved by the Grand Duke on January 31, 1865, according to which the institution is placed under the immediate management of the minister of the interior. Its particular administration is conducted by a director and two councils. The director is annually elected by the professors and confirmed by the Grand Duke. One of the councils (*kleiner Rath*) consists of the director, his predecessor in office, and three of the professors elected by the faculty and confirmed by the minister. The other and larger council (*grosser Rath*) comprises all the professors.

The applicant for admission to the regular courses must be seventeen years of age at least, and possess such educational qualifications as are prescribed for the different schools. The certificates of age, morality, &c., are similar to those required by other European institutions. The matriculation fee is 5 florins 30 kreutzer, ($2 20;) tuition, 66 florins ($26 40) per annum, payable in advance. Students not pursuing a regular course, but simply attending such lectures as they prefer, (*Hospitanten*,) pay 2 florins (80 cents) for each separate course of lectures running through the half-year, up to the amount of 40 florins, beyond which no further charge is made. The fees for the chemical laboratory are 44 florins per annum for regular students, and for others 60 florins. In the philosophical laboratory the fees are 8 florins per half-year; in the mineralogical laboratory, 2 florins; in the agricultural laboratory, 10 florins.

The several courses in the seven professional schools embrace very thorough and complete instruction in mathematical science; natural sciences; economical sciences; jurisprudence, in its relations to the several professions embraced in the school; history; fine arts; science of engineering in all its branches; mechanics, theoretical and practical; technology; architecture; forestry; agriculture; and foreign languages.

The following is the programme of the several schools:

1. Mathematical school.—The full course embraces two years. The qualifications required for admission are a thorough knowledge of elementary mathematics, to wit, algebra, plane geometry, stereometry, and plane trigonometry. For the benefit of such persons as may not be thoroughly acquainted with all these branches, regular preparatory instruction is given in them by one of the mathematical professors assigned to that work.

First year's course. Application of plane trigonometry and theory of spherical trigonometry; higher equations; differential and integral cal-

culus, (first course;) analytical geometry, plane; descriptive geometry, (first course;) constructive exercises in descriptive geometry, (first course;) experimental physics; free-hand drawing.

Second year's course. Differential and integral calculus, (second course;) analytical geometry; geometry of space; descriptive geometry, (second course;) constructive exercises in descriptive geometry, (second course;) practical geometry, (first part;) plane drawing; surveying excursions in summer; analytical mechanics; mineralogy; geology; mathematical physics; exercises in the physical laboratory; general chemistry, (first course, divided into general and inorganic and organic;) free-hand drawing.

2. SCHOOL OF ENGINEERING.—This school embraces all branches of engineering except the construction of fortifications. The term of study is two and a half years. Applicants for admission must have the general educational qualifications acquired in a gymnasium, as well as a knowledge of the mathematical branches taught in the mathematical school. They must also have the certificate of a physician or surgeon to their bodily qualifications essential to a practice of the profession of engineer.

The instruction in this school is given in three courses—the first two of one year each and the third of one-half year's duration.

First year's course. Durability, (*Festigkeitslehre;*) practical hydraulics and the theory of heating; economical science; free-hand drawing, landscape drawing, and drawing in water-colors; river and street engineering, (*Wasser- und Strassenbau,*) first course; constructive exercises connected with river and street engineering; elementary principles of machinery, (*Maschinenlehre;*) machine-building, (first course;) construction of machines, (first course;) chemical technology; technical course in architecture; drawing and planning of architectural objects, (first course;) scientific principles of building with stone, (*Steinconstructionen.*)

Second year's course. Select studies in mathematical physics; general principles of industry and commerce; general and the most important principles of civil rights; free-hand drawing, landscape drawing, and drawing and coloring in water-colors; river and street engineering, (second course;) railroad construction, and constructive exercises connected therewith; theory of power machines; theory of economical heating; theory of the most important operative machinery; machine-building, (second course;) mechanical technology; drawing and designing of architectural objects; high architecture, (first course.)

Concluding half-year's course. The object of this course is to teach the special applications of engineering in the public service of the Grand Duchy of Baden—river engineering and road construction; the working-up in detail great engineering projects; practical geometry, (second part;) higher geodesy; higher architecture; practical exercises running through the whole term in constructions, planning, &c., and excursions to visit important public buildings and works.

3. THE SCHOOL FOR MACHINISTS.—This school is designed for the instruction of pupils proposing to engage in those branches of manufacture and industrial pursuits, such as the building of machines, &c., as require a thorough knowledge of the higher mathematics. The term of study is three years. A two years' course is also provided for persons whose contemplated pursuits do not necessarily involve a knowledge of the higher mathematics and mechanics. Only such pupils are admitted as have either passed through the first course in the school of mathematics, or are able to pass a thorough examination in the branches therein taught.

First year's course.—Differential and integral calculus, (second course;) analytical geometry; descriptive geometry, (second course;) constructive exercises; analytical mechanics; mineralogy; geology; general chemistry, (first course;) free-hand drawing, landscape drawing, and coloring; science of mechanics, (first course;) construction of machines.

Second year's course.—Practical geometry, in the field; durability and capacity of materials; practical hydraulics; mathematical physics; general economical science; free-hand drawing; landscape drawing and coloring; river engineering and road construction, (first course;) constructive exercises; elements of mechanics; construction of machines, (first course;) chemical technology; metallurgy; work in the mechanical shops, (two hours in the evening.)

Third year's course.—Select studies in mathematical physics; general principles of industry and commerce; free-hand drawing; landscape drawing and coloring; river and road engineering, (second course;) railroad construction; theory of power machines; theory of economical heating; theory of operative machinery in its important applications; solutions of selected and difficult problems in mechanics; mechanics, (second course;) construction of machines; mechanical technology; practical exercises in the machine shops.

4. SCHOOL OF ARCHITECTURE.—The school of architecture embraces two divisions, higher and lower; the entire period of study being four years. The object of the lower division, which includes two courses, is to qualify the student for the duties of superintending the construction of buildings generally and to plan and construct private and other buildings of minor importance. It also serves as a preparatory school for the higher division.

The conditions for admission are not materially different from those required for the preceding schools.

First course in lower division.—Analytical mechanics, five hours a week; descriptive geometry, (second course;) constructive exercises, (second course;) technical mineralogy and petrography; general chemistry, (first course;) economical science; free-hand drawing and landscape drawing; ornamental drawing, (first course;) properties of building materials; architectural statics, (*Baustatik;*) drawing after models and copies, (first course;) modeling in wood; drawing of plans after copies and planning of smaller buildings.

Second course in lower division.—Properties of building materials; principles of industry and commerce; free-hand drawing; landscape drawing and coloring; ornamental drawing, (second course;) river and street engineering, (first course;) modeling in plaster; practical exercises in building arches; drawing and designing of buildings, (second course;) technical architecture, (first division;) designing larger dwellings and farm buildings; architectural estimates.

First course in higher division.—Practical geometry; free-hand drawing; landscape drawing and coloring; figure drawing, (first course;) ornamental drawing, (third course;) painter's perspective; modeling of ornaments from plaster casts and copies; technical course in architecture, (second division;) designing larger dwellings and public buildings; higher architecture, (first course;) history of art, especially including ancient architecture; graphical studies, (first course.)

Second course in higher division.—General and most important principles of civil rights; free-hand drawing; landscape drawing and coloring; figure drawing, (second course;) ornamental drawing, (fourth course;) painter's perspective, (second division;) modeling of ornaments from original designs, and studies in modeling from nature; designs for monumental structures, combined with exercises in decoration; higher architecture, (second course;) history of the architecture of the Middle Ages and modern times; graphical studies, (second course.)

At the conclusion of the fourth year's study the general conditions for an architectural design are submitted to the whole class, and the successful competitor is awarded the prize of a gold medal.

5. School of chemistry.—The professional school of chemistry is designed to meet the wants of such pupils as intend to become naturalists, pharmaceutists, miners, conductors of chemical manufactories, or to devote themselves to the profession of chemical technology. It is assumed that those who would enter are already grounded in the general principles of this and the collateral sciences, and hence the instruction is limited to one course.

Course of study. Crystallography; mineralogy; geology; practical mineralogy; botany; zoology; experimental physics; recitals and examinations in physics; mathematical physics, (optics and electricity;) exercises in the physical laboratory; general chemistry, (first course—general and inorganic;) recitations and examinations; analytical chemistry; geometry; assays of ores and metals; theory of dyeing, (especially referred to the production of dyes from coal-tar;) practical work in the laboratory; general economic science; general principles of industry and commerce; chemical technology and metallurgy.

6. School of forestry.—Applicants for admission must not only comply with the general conditions before referred to, and have passed through a gymnasium, or advanced to the highest class in a lyceum, but must also establish the fact that they possess a sound constitution and are not short-sighted. Such as do not propose to enter into the

service of the state are allowed to select such branches or courses of study as they prefer to pursue. There are three courses of study, to wit:

First course. General arithmetic; plane geometry; plane trigonometry; stereometry; drawing of plans; botany; botanical excursions; zoology; experimental physics, with recitations; general principles of civil rights; preliminary survey of the general subject of forestry.

Second course. Political arithmetic; plane polygonometry; practical geometry; drawing of plans, exercises in surveying, with particular reference to the state regulations for forest surveys; mineralogy; geology; practical mineralogy; meteorology; climate and soil; general chemistry, (first course—general and inorganic and organic;) general economical science; natural history of forest trees; forestry mathematics, with exercises and practical applications; cultivation of forests; uses of forest products, and technology; valuation of timber; practical demonstrations in the forest.

Third course. Agricultural chemistry; general land and forest economy; laws relating to forests and to hunting; solution of difficult forestry calculations; protection of forests and entomology; forest management and statistics; forest plans and valuation; valuation of forest lands; forest products, and relative valuations; forest administration; forest roads and water engineering; constructive exercises and surveys for forest roads, &c.; forest police; development and history of forest literature; practical demonstrations in the forest; lectures and labors in the forest seminary and laboratory; principles of the cultivation of plants, (agricultural.)

7. AGRICULTURAL SCHOOL.—The objects of this school are, first, to give to young men, who are to devote themselves to agriculture, a scientific basis for their calling; secondly, to provide practically educated agriculturists an opportunity to acquire a solid scientific education; thirdly, to enable students of the political sciences to gain a knowledge of the most rational system of agriculture. It is the purpose, however, simply to ground the pupils in the principles of the science and art as based upon the mathematical, physical, and natural sciences, and political economy, and not to attempt instruction in actual agricultural practice.

The term of study is two and a half years. During the first course, which embraces three half-year courses, the instruction is exclusively confined to the sciences on which agriculture is based. At the opening of the second course, the duration of which is one year, the applications of science to agriculture as a profession commence. This final course is also so arranged as to afford time for the pupils to avail themselves of the opportunities afforded by the lectures in the other schools to acquaint themselves more fully with those sciences which are essential to a higher general culture.

The educational qualifications demanded for admission to the agricultural school are such as are usually provided by the burgher or citizens'

schools of the German states. It is recommended that pupils enter at the beginning of the school year, (October 1,) as it is only in this manner that they can thoroughly complete the full course of study in two and a half years. Nevertheless, such applicants for admission as have already acquired a knowledge of the branches included in the first course may, at the discretion of the director, enter at once upon the second course. Persons of riper years, who do not wish to pursue a complete and thorough course of study, are also admitted to the privileges of the school as auditors, (*Hospitanten*.)

The courses of instruction are as follows:

First and second half-years of first course. Trigonometry; elementary mechanics; mineralogy; geology; botany; botanical excursions; zoology; experimental physics; recitations in physics; general chemistry, (general and inorganic part, and organic;) general economy, including the more prominent principles of political science; anatomy and physiology of domestic animals.

Third half-year of first course. Practical mineralogy; practical botany and zoology; exercises in the physical laboratory; meteorology, climate, and soil; agricultural chemistry; practical work in chemical laboratory; chemical technology of organic substances; practical animal physiology.

Second course. Surveying and drawing of plans; practical mineralogy; botanical excursions; practical botany and zoology; agricultural entomology; practical operations in the chemical laboratory; general and more important principles of civil rights; general principles of agriculture and forestry; general arrangement and management of farms, including agricultural book-keeping; principles of the valuation of lands and agricultural products; and finally, cultivation of plants, including chemical composition and histology; food of plants; conditions of assimilation; mode of assimilation of food; arable soil, its origin, composition, and adaptations; atmospheric air, its composition, the distribution of rain, and the relations of air to vegetation; preparation of the soil, including drainage, irrigation, amelioration by mixtures of clay, muck, and natural fertilizers generally, working of the soil, manuring, covering and shading of the soil, rotation of crops, fallowing, sowing and planting, treatment during growth, and harvesting; general and special cultivation of each of the ordinary agricultural plants; cultivation and management of meadows; vineyard and orchard culture; care of domestic animals; points of domestic animals; principles of shoeing; principles of breeding, (embracing several divisions;) agricultural machines and implements; agricultural dissertations or discussions; agricultural excursions—every two weeks one, occupying a half day, and two or three more extended ones during the term—and practical operations in the agricultural and forestry laboratory.

It is perhaps needless to add that the instruction in this great school is no less thorough than the array of studies is extensive. The corps of instruction consists of twenty-six professors, and seventeen adjunct pro-

fessors and assistants, and includes some of the ablest teachers in Germany. The collections and laboratories—especially the chemical laboratory, one of the best planned and equipped that I have found anywhere—together with the library and spacious apartments for lectures, exercises and demonstrations, constitute an *ensemble* of which the wealthiest kingdom in the world might well be proud.

The number of students in actual attendance at the date of my visit in 1867 was 501, including representatives of twenty-six different countries, kingdoms, and duchies; and the number sometimes reaches a still higher figure.

BAVARIA.

The polytechnic schools of Bavaria, including those of lower as well as those of higher grade, number over twenty. Chief among them, and eminently worthy of the high title it bears, is the Royal Polytechnic School, located at Munich.

Founded in 1833, and ever since ably managed, it has exerted a powerful influence upon the industry of Bavaria, and contributed not a little to the general elevation of the practical arts. It has always labored under the disadvantage of ill-adapted buildings, however, until at last the government has nobly come to its aid by making provision for the immediate erection of a magnificent edifice at a cost of 1,000,000 florins. The plans were prepared after much time spent by the architect in the examination of similar structures, and is believed to embrace the best features of all. It stands in the immediate vicinity of the great art galleries of Munich, and, at the time of my visit to the institution, was already nearly half completed.

The government appropriation to the school for some years has been about $15,000 per annum.

At present the institution comprises simply a school of mathematics and a school of architecture and engineering.

The mathematical school embraces three very complete courses, beginning with analytical geometry and the school of architecture and engineering, two thorough professional courses, so organized that the pupils who enter the mathematical department and complete the several courses there, are enabled to pass directly, and with economy of time, into the professional department.

Students pay a fee, in the first school, of 12 florins; and for each course in the professional school, 6 florins; for use of chemical laboratory, 4 florins 30 kreuzer.

The number of students in May, 1867, was 300; number of professors and other teachers, 19.

It is the purpose, on the completion of the new edifice, to give the school a further expansion in order to meet the wants of other technical professions, and at the earliest day possible to give it a place in the

front rank of the most extensive and progressive polytechnic schools in Europe.

The school at Angsbnrg is also in a flonrishing condition.

POLYTECHNIC SCHOOL OF HANOVER.

The polytechnic school of Hanover is also an extensive and highly flourishing institution. It was founded by government in 1831, which appropriated, in aid of its support, $12,000 annually until 1837, and then erected for its use the present magnificent edifice, one of the finest and most extensive public bnildings in the kingdom. Nor did the liberality of the government stop there; for since that date the sum of $24,600 has been annually appropriated from the royal treasury to enable the institution to furnish instruction at moderate rates, and so multiply its benefits.

In common with most institutions of its class, this school inclndes a preparatory department for mathematical stndies, which in this case occupies two years, and is divided into what are known as the preparatory school and the high school.

The preparatory school includes the lower mathematics with the first elements of the analytical branches; also botany, zoology, mineralogy and drawing.

The high school of mathematics, beginning with differential calculns, and including descriptive geometry, practical geometry, and mechanics, in their varions departments, qualifies the student to knock for admission at the door of either one of the following professional conrses:

1. Conrse for the technical chemist, two years.
2. Course for the agriculturist, two years.
3. Course for the geometer, one year.
4. Course for machinists.
5. Conrse for architects, three years.
6. Course for river, road, and railway engineers, three years.

The instruction is given by the director and 24 other able professors and teachers, with the aid of superior facilities in the way of extensive cabinets, mnsenms, laboratories, and a library of 18,000 volumes.

In the school of mathematics, pupils pay a tuition fee of about $20 per annnm; in the polytechnic school proper, $8 to $20, according to the number of studies. The cost to the student of living is estimated by the director at $400 to $600, including everything.

The amount realized from fees of pupils averages nearly $10,000 per annum. There were in attendance npon this institution, last year, 466 pupils, gathered from all parts of Europe, and inclnding 14 from America.

SAXONY.

The Royal Indnstrial School of Saxony is no other than a polytechnic school, and as such deserves mention under this head. It embraces three sectious; one for stndents who wish to prepare for agricultnral

pursuits, one for those who expect to devote themselves chiefly to the chemical arts, and a third for pupils preparing for trades in which complicated machinery is a prominent feature.

The term of study for pupils belonging to the agricultural and the chemical sections is three years; for the third, four years.

The course of instruction throughout the first, and during a part of the second year, is common to all three; including German language, arithmetic, geometry, natural philosophy, natural history, chemistry, architectural drawing.

From this point forward, until the close of the third year, except that all are still required to study German and architectural drawing, the courses of study vary for the three sections according to the ulterior purposes of the students in each.

The agricultural pupils are instructed especially in the subject of soils and manures, agricultural chemistry, the culture of plants, cattle-breeding, machinery and mechanical technology, agricultural mechanics, agricultural architecture, and general farm management. The teachers explain to them the modes of practice, in the field and garden, and occasionally take them to places, more or less remote, on agricultural excursions.

The students in the chemical section, meanwhile, and to the end of their course, devote themselves to general and technical chemistry, mineralogy, geognosy, and mechanical technology.

The mechanical section is occupied during the same period with the doctrine of projection, practical geometry, drawing, practical exercises in surveying, mathematical analysis, special trigonometry, analytical geometry, mechanics, descriptive geometry, and drawing of machines; and, subsequently, (during the fourth year,) with the study of machines, drawing of machines, perspective drawing, the higher mathematics, mineralogy, and geognosy, and with theoretical and analytical chemistry. If the pupils have time to devote to them, they are also instructed in commercial bookkeeping and correspondence and in the English and French languages.

The instruction is given by eighteen competent and zealous professors and teachers, who, besides the training they give to their pupils, frequently avail themselves of the opportunities afforded by the many mechanical shops and chemical works of the busy industrial town of Chemnitz for giving them a practical insight into the various branches of industry theoretically taught in the school.

There are also connected with this institution two schools of trades for journeymen carpenters, masons, machine builders, &c., attended by fifty to one hundred pupils each, who receive instruction (chiefly theoretical, since they are already somewhat familiar with the practice of their several trades) in the German language, arithmetic, geometry, mechanics, and physics, natural philosophy, mechanical technology, general architecture, mechanical drawing, perspective, model drawing, and modeling.

After what has already been said of practical education in Saxony, it is needless to add that the school above reported is only a representative of a large number of institutious looking to the same practical end.

SWITZERLAND.

The Federal Polytechnic School of Switzerland, at Zurich, was founded in 1854, by the government. It is a natural and yet very remarkable ontgrowth of the excellent system of public instruction in Switzerland—itself the product of the intellectual force and freedom of the people of that mountain republic. The government and people had long desired the permanent establishment of two leading national institutions of learning—a university, for the highest general culture, and a polytechnic school that would contribute to assure the material prosperity and the steady industrial development of the whole country. For a time the struggle among the cantons for the location of the new institutions delayed the realization of this noble purpose. But at length that difficulty was conqnered and both the university and the polytechnic school were wisely planted together at Zurich.

A fear lest this branch of my general subject occupy more than its dne share of space occasions hesitation in giving a somewhat detailed account of still another of the great polytechnic schools of Europe; and yet the rank to which this institution is entitled, as in some respects the superior of all others of its class, together with the fact that, so far as I am aware, no account of it has hitherto appeared in any American publication, appears to warrant it.

The superior control of the school is vested in the Swiss Federal Council. The more immediate control is intrusted to a council of its appointment, known as the council of the school. The executive officer of the school, known as director, is selected from among all the professors by the council of the school. He is appointed for only two years, bnt is re-eligible. The professors, also, are appointed by this council. Each particular department of the school is under the immediate direction of a principal; the whole nnmber of the principals constituting the staff of the director.

The institution, as a whole, comprises—

1. The preparatory school of mathematics.
2. The school of architecture.
3. The school of engineering.
4. The school of mechanics.
5. The school of chemistry.
6. The school of forestry.
7. The school for professional teachers.
8. The school of general philosophy and political science.

1. PREPARATORY SCHOOL OF MATHEMATICS.—The term of study iu the preparatory school is one year. The course embraces the following subjects, to wit: Algebra and analysis of algebra; geometry of space;

plane and spherical trigonometry; analytical geometry of plane surfaces; elementary mechanics; applications of geometry; experimental physics; chemistry; French language; German language; industrial design. Recitations and examinations in both German and French.

During the summer, pupils designing to devote especial attention to the natural sciences have the opportunity of following a preparatory course in mineralogy and botany.

2. SCHOOL OF ARCHITECTURE.—The instruction given in the school of architecture occupies three years, and embraces the following studies:

First year's course. Differential and integral calculus; preparation of plans for stone-cutting, (lectures and exercises;) descriptive geometry; perspective; chemical technology of building materials; principles involved in the construction of machines; drawing of machines; compositions and exercises; history of architecture of the Middle Ages and modern times; petrography; ornamental drawing; landscape drawing; modeling; experimental chemistry.

Second year's course. Principles of architecture; comparative architecture; exercises in composition; masonry and carpentry; principles involved in architectural constructions; exercises in architectural constructions; shadows and perspective; mechanics; water and road constructions; arch-building; figure drawing; petrography; civil rights, as applied to architecture.

Third year's course. Principles of architecture; exercises in composition; exercises in architectural constructions; architectural drawing; masonry and carpentry, with exercises; ornamental drawing; technical geology; history of art; civil and administrative rights.

3. CIVIL ENGINEERING.—The instruction given in the school of civil engineering occupies three years, and includes the following courses:

First year's course. Differential and integral calculus, (repetitions, the scholars in groups;) analytical geometry, (with daily repetitions, the scholars in three groups;) preparation of plans for cutting of stone, (lectures and exercises;) geometry of position; descriptive geometry, with exercises; technical mechanics, (with repetitions, the scholars in three groups;) chemical technology of building materials; principles involved in the construction of machines; exercises in machine construction; machine drawing; technology and description of the parts of machinery; experimental chemistry; petrography.

Second year's course. Differential and integral calculus, with repetitions; technical physics, with repetitions; graphic statics; various applications of the most important portions of integral calculus; practical hydraulics; technical mechanics; astronomy, (first part, with exercises, pupils in groups;) petrography; experimental physics; topography; geodesy; design; surveying; masonry and carpentry; wood and brick constructions; road-building, and construction of railways and bridges; hydraulic constructions; astronomical exercises at the observatory; perspective; chart-drawing; administrative rights.

Third year's course. Canal and river constructions; geodesy; astronomy, with exercises at the observatory; exercises in construction; iron, brick, road, and railway constructions, (second part;) chart-drawing; administrative rights.

4. SCHOOL OF INDUSTRIAL MECHANICS.—The instruction furnished in the school of industrial mechanics also occupies three years, and embraces the following studies:

First year's course. Differential and integral calculus; recitations and repetition by pupils, (the scholars in gronps;) descriptive geometry, exercises and repetitions; analytical geometry, with repetitions; machine drawing; industrial physics; technical chemistry of building materials, with repetitions.

Second year's course. Differential and integral calculus, (second part,) with repetitions; technical physics, with repetitions; technical mechanics, with repetitions, (the scholars in groups;) construction of machines; principles of machine construction, (first part;) mechanical technology.

Third year's course. Principles of machinery, locomotives and marine engines; analytical mechanics; technology of machines, establishment of machines; civil constructions, with exercises; metallurgy; construction of iron bridges and railways.

5. SCHOOL OF CHEMISTRY.—This school includes two conrses, one for pharmaceutists and one for industrial chemists, and embraces the following branches:

First year's industrial course. Inorganic chemistry; organic chemistry; analytical chemistry; practical exercises in analysis; metallurgy; chemical technology of building materials; technology and description of machines.

Second year's indnstrial course. Crystallography; mineralogy; chemical analysis; geology; general, agricultural, and industrial botany; zoology; experimental chemistry; technical drawing.

One year and a half's course in pharmaceutical chemistry. Experimental inorganic chemistry; organic chemistry; analytical chemistry; practical exercises in analysis; manufacture of chemical products; metallurgy; exercises in chemical technology; pharmaceutical chemistry; experimental physics; mineralogy; geology; general, special, and pharmaceutical botany; zoology; pharmacology.

6. SCHOOL OF FORESTRY.—Instruction in the school of forestry continues for two years, at least. The following are the annual courses of study:

First year's course. Forest mathematics, and the customs of foresters; principles of general botany; topography; plain drawing; field measurement; encyclopedia of the science of forestry; excursions, practical operations in the forest, and exercises in the principles of valuation; petrography; agricultural chemistry; rights of the forester.

Second year's course. Management of forests; forest statistics; art of directing forest exploitations; culture and preservation of forests; cos-

mography; topography; excursions into the forest, and practice in the valuation of lands and timber; exercises in relative valuations; design of plans; surveying; construction of roads and hydraulic works; forest entomology; petrography; forest rights under the law.

7. NORMAL SCHOOL.—In the normal school the term of study is at least two years for pupils designing to teach the physical sciences, and not less than three years for those designing to teach the mathematical sciences. The following are the courses of instruction in the two sections:

First year's course in scientific section. Selections of the important portions of inorganic chemistry; practical analysis; experimental chemistry, with repetitions; experimental physics, with repetitions; mineralogy, with recitations and repetitions; zoology, with repetitions; general botany.

Second year's course in scientific section. Principles of crystallography; general geology; manufacture of chemical products; practical analysis; physiology of plants; culture of plants, and treatment of diseased plants; exercises in microscopy.

First year's course in mathematical section. Theory of numbers; differential and integral calculus; theory of functions, with repetitions; analytical geometry of the plane; experimental physics, with repetitions; experimental chemistry, with repetitions; descriptive geometry, with exercises and repetitions; synthetic geometry; machine-drawing.

Second year's course in mathematical section. Differential and integral calculus, (second part;) theory of numbers, (second course;) technical mechanics; astronomy, (first part;) synthetic geometry, with repetitions; shadows and perspective.

Third year's course in mathematical section. Important selections from the theory of partial differential equations; theory of numbers; analytical mechanics; principles of mechanism; astronomy, (second part,) with exercises in the observatory; physical surveys; art of teaching mathematics.

8. SCHOOL OF GENERAL PHILOSOPHY.—The instruction in the school of general philosophy is designed for such advanced students of mathematics, the natural and physical sciences, language, literature, and philosophy, as may desire to avail themselves of the opportunities afforded by both the university and the polytechnic school for a higher proficiency in these several departments of learning. While sufficiently flexible to accommodate the somewhat varied needs of different students, the course of study includes the following branches, to wit:

a. Natural science group.—Experimental physics; magnetism, electricity, optics, with recitals and repetitions; theories of heat; crystallography; organic chemistry, with exercises; experimental inorganic chemistry; analytic chemistry; geology of Switzerland; special botany, botany of officinal plants, with excursions; vegetable physiology; diseases of cultivated plants; exercises in microscopy; electro-dynamics and electro-magnetism; recitations in inorganic and organic chemistry;

physical geography, considered in relation to practical questions; theory and practice of photography.

b. Mathematical group.—Synthetic geometry; treatment of geometric problems; selected portions of differential and integral calculus; exercises in integral calculus; exercises in technical mechanics; stoichometry, and gasometric calculations; geometry of the plane; exercises in constructions based on plane geometry; select analyses in integral calculus; agricultural machines; elements of astronomy and mathematical geography, with demonstrations.

c. Language and literature.—Modern German literature, and its relation to other European literature; Italian comedy; the artistic writings of the period of Leonardo; exercises in language; English language; Shakespeare; lectures upon and exercises in French language and literature; superior exercises in composition.

d. History and political philosophy.—Political science; financial economy; lectures and disputations on national economy; history of the Reformation; history of America, from the discovery to the present time; history of mediæval and modern art; explanations of the sculptures found in archæological museums; constitution of Switzerland; applications of political economy—freedom of industry and commerce; elementary course in statistics; commercial law; history of Swiss art; history of geography; the Russian, Ottoman, and Eastern empires, considered with reference to the national economy; history of Switzerland as the Helvetian Republic.

e. Fine-arts group.—Exercises in modeling ornaments, &c., and in carving in stone; ornamental drawing; landscape drawing and painting in water-colors; figure-drawing.

The instruction in the schools above recited, and which together constitute the Federal Polytechnic School, is given by a corps of sixty-two professors and teachers, with the use of the following auxiliaries: an extensive library, adapted to the wants of the school; a collection of impressions, &c., of figures and architectural ornaments in plaster, serving as models in the different branches of design; a collection of representative specimens of building material, with select models for various constructions; an assortment of surveying and geodetical instruments; an assortment of utensils and materials for illustration in technological mechanics; a collection of models and materials used in technological chemistry and pharmacy; a collection of objects, models, and tools used in forestry; collections illustrative of zoology, botany, mineralogy, geology, and paleontology—one of the largest and best arranged in Europe; an archæological museum; a laboratory for exercises in modeling in earth and in plaster; a workshop for working in wood; a workshop for the construction of machines chiefly metallic; a laboratory for chemical analysis; a laboratory for industrial chemistry and pharmaceutic manipulations; a physical laboratory and cabinet; an observatory; a botanic garden; the forests, collections, and libraries, access to which

is furnished by the canton and city of Zurich, conformably to existing agreements with the federal government.

As in other like institutions, the students are of two classes—regular pupils and auditors, or such as attend partial courses or devote themselves to individual branches. The first named can only be admitted at the commencement of the year, (October 15,) exceptions being made for grave reasons.

The certificates of age, (at least seventeen years,) of good moral character, &c., demanded of regulars, are of the usual kind. The educational qualifications are determined by examination, unless satisfactory credentials from institutions of high character are presented.

Auditors are submitted to the same tests of qualification as regular pupils, except they present certificates showing that they have completed technical courses of study of high grade elsewhere, or are men of ripe age, proposing to extend their theoretical knowledge in certain branches of their profession. They are admitted to the libraries, laboratories, &c., on the same terms as other students.

The fees demanded are 5 francs for matriculation, 100 francs per annum for tuition, and a small sum for the use of libraries, laboratories, &c. By paying a moderate fixed amount each pupil is entitled, in case of sickness, to a separate room and gratuitous treatment in the cantonal hospital for the period of six weeks. The average amount demanded by licensed private teachers (*agrégés*, *Privat-docenten*) averages about 5 francs for one weekly lesson per half-year. Students distinguished for ability and application, who are unable to pay the fees, are gratuitously furnished with all the advantages the institution can afford.

In order to awaken emulation, to encourage scientific labor, and to recompense the application of students, there is opened each year a competition (*concours*) upon a given subject—the first time for three, the second for four divisions of the school, and the third time for all. A first and a second prize are awarded to the two best memoirs presented at these competitions, a sum for this purpose being set apart each year by the school. To meet the expenses incurred by the competitors for material, &c., used in their researches, a credit of 500 francs, payable to the successful competitors, is granted by the council. These competitive trials remain open eighteen months after their declaration, and the prizes are formally distributed on commencement day, the names of the successful competitors being also published in the Federal Bulletin.

No student is permitted to pass from one division of a school into a higher until after having passed a satisfactory examination in the lower. If unable to do this, he is allowed to continue in the same one year more, after which he must rise into the next class or quit the school.

The diploma of the institution is intended to distinguish high merit, and will in no case be accorded to pupils whose capacity and knowledge of branches pursued, as determined by thorough and rigid examinations, are not incontestably above medium. The diploma fee is 50 francs, and

the degrees confer the title of architect, engineer, mechanical engineer, chemist, pharmaceutist, forester, teacher in the mathematical and physical sciences, according to the course of instruction pursued.

The number of students attending the school during the winter semester of 1866–'67 was 548, of whom 93 were in the preparatory school of science and mathematics, 142 in the school of engineers, 152 in the technico-mechanical school, 69 in the school of chemistry, 21 in the school of forestry, and 29 in the normal school. Enumerated by countries, 234 were from the several cantons of Switzerland; 149 from seventeen of the German states; 129 from the other European states, from Italy on the south to Finland on the north; 2 from Asia; 12 from North and South America. Subsequently, at the date of my visit, the number had reached to nearly 700.

In concluding this general account, I feel myself warranted in awarding a special tribute of high praise to an institution which, though among the most recently organized, nevertheless, for the variety, range, and flexibility of its courses of study, the number of its able instructors, the extent, magnificence, and adaptedness of its buildings, and the number, variety, and completeness of its auxiliaries, even thus early in its career stands foremost of its kind in the world.

ITALY.

Polytechnic education in Italy has received but little development. A strong tendency in that direction is indicated, however, by the recent establishment—mainly since 1860—of numerous elementary technical schools (*scuole tecniche*) in all parts of the kingdom; of several institutions of higher grade, known as technical institutes; and, just recently, of a polytechnic school at the capital.

The instruction in the technical school is limited to about the following branches, the scheme of studies varying somewhat: Italian language; mathematics, (arithmetic, algebra, and geometry;) writing and keeping of accounts; natural science, geography, and history; physical chemistry; linear and ornamental design; French language; gymnastics; rights and duties of the citizen.

The controlling officers are a director, vice-director, and spiritual director, (*direttore spirituale.*) The teachers have the rank and title of professor.

In 1865 the number of these establishments was 177; number of pupils, 8,831. In 1866 the number of such schools had increased to 205.

Of technical institutes there were, in 1865, 59, employing 510 professors and teachers, and giving instruction to 4,337 pupils; 25 of the schools had valuable libraries, with a total of 57,281 volumes, and 37 of them were provided with mathematical instruments, having the value of \$144,636; 33 of the schools belong to the government, 5 to the provinces, and 16 to the communes. The 33 government schools had, in 1865, a revenue of \$200,059, of which \$72,000 was furnished by the state.

The course of instruction in them varies considerably, according to circumstances; but, for the sake of illustrating their character as technical schools, I present an outline programme of the studies in the Superior Technical Institute, at Milan, premising with the statement that it ranks somewhat above the majority of the schools bearing the same general title.

Branches taught: mechanics, theoretical and applied; physical technology; agriculture and rural economy; geology and mineralogy, with practical applications; industrial mechanics and construction of machines; geodesy; topography and topographical design; applications of descriptive geometry to the art of design; construction of roads and railways; river and agricultural hydraulics, hydraulic constructions, and aqueducts; jurisprudence of agriculture, and the elements of administrative law; measurement of velocities, (*celerimisura;*) architecture; industrial chemistry, with exercises in the laboratory; botany; perspective; the art of ornamentation; elements of figure.

The instruction in the above branches of study is given by twelve regular professors, assisted by seven professors connected with other institutions, who either deliver lectures on the branches taught in the institute or give instruction in the laboratories.

At Florence there is a technical school of like general character, and sometimes called polytechnic, in which scientific instruction is given by some of the most eminent scientific men of Italy. And at Turin, Naples, and Ferrara there are professional schools of engineering, &c., in which the instruction given entitles them at least to honorable mention under the general head of polytechnic schools, especially as they are alive to the importance of the earliest possible expansion into schools of wider range and higher rank.

A country that has given to the world the mariner's compass, the telescope, the galvanic battery, the Voltaic pile, and the discovery of this grand new hemisphere, and in whose men of genius still burns—and burns with a stronger flame, being fanned anew by liberty—the fire of a noble ambition to further contribute to the progress of mankind, will be a leader and not always follow in the wake of the New Civilization.

SCANDINAVIAN STATES.

The polytechnic schools of the Scandinavian states are few and of recent establishment, the only ones of which I have knowledge being the Danish school at Copenhagen and the Swedish school at Stockholm. Of both of these I am also able to speak in high terms, from personal knowledge gained by recent inspection, and only regret that the space to which it seems proper to limit this portion of my report will not admit of more than a very brief reference to each of them.

The Polytechnic School at Copenhagen is connected with the Royal University, as one of its schools, by virtue of which arrangement it derives much advantage from the courses of instruction given by that

institution in the departments of mathematics, the natural and physical sciences, language, political economy, &c., as well as from the collections, chemical laboratory, and extensive library with which the university is so well provided. A new, large, and handsome building, for the better accommodation of its valuable geological and other collections in natural history, as well as the extension of its laboratories, shows the estimate in which it is held by the government, and the spirit with which its development is being pushed by those who have its interests in charge.

The Royal Technological Institute at Stockholm was founded by the government in 1858, since which date it has been furnished with very commodious and costly buildings, with furnished laboratories and much valuable machinery for the mechanical division, and also favored with an annual appropriation of 55,000 rixdollars, (about $14,600.)

The school year begins September 1. Applicants for admission are required to be sixteen years of age at least, and to have a good knowledge of the Swedish language, of geography, and of Swedish and general history, a mastery of general arithmetic, algebra, plane geometry, trigonometry, and an acquaintance with the first principles of physics and inorganic chemistry.

The full term of study is three years, and the course of study embraces the following general branches of study: analytical geometry; differential and integral calculus; practical geometry, applied to land, road, and river surveys; descriptive geometry; theoretical mechanics; applied mechanics; mechanical technology; general physics; chemistry and chemical technology; work in the laboratory; mineralogy and geognosy; general engineering; drawing and coloring.

The instruction is given by the director of the institute and fifteen other professors and teachers; number of pupils in 1867, 86.

The success of this institution will doubtless lead to the early establishment of others of the same class.

RUSSIA.

Technical education in Russia is widespread and rapidly advancing, though at present chiefly confined to schools of the primary and secondary class, the number of which is very great.

Among those that specially require notice, the most important is the Technological Institute of St. Petersburg. At its origin this institution was designed for the training of boys in the mathematical and scientific branches taught in real-schools, together with professional exercises. But in 1861 it was entirely reorganized and put upon the higher polytechnic basis; so that it now ranks among the most successful and most useful of the technical institutions of Europe.

Applicants for admission must have attained the age of sixteen years and have already received such secondary education as is furnished in a college or lyceum.

The course comprises four years, being divided into theoretical and

practical, with two distinct professional faculties, the faculty of the chemical sciences and the faculty of the mechanic arts.

The number of students in 1867 was 600, of whom 80 were aided by the state, and 50 of whom were gratuitously supported—the rest paying $24 per annum for theoretical instruction and $30 for practical training in the workshops and laboratories.

In the way of material facilities the institution is well provided, having large workshops well equipped with tools and machinery, laboratories for applied chemistry, a factory for products obtained by the decomposition of wood by distillation, a distillery, a dyeing establishment, a gas-factory, and a museum of models of the latest improvements of every mechanical sort deemed desirable for introduction from foreign countries, as well as such models of superior quality as are executed by the pupils themselves.

The Russian government is also establishing schools of this character in other parts of the empire, and it is understood that the movement has received a new impetus from the demonstrations made in this department by so many of the progressive nations at the Exposition.

WURTEMBERG.

The Royal Polytechnic School of Wurtemberg, at Stuttgart, organized in 1862, has thus soon acquired a very honorable position among institutions of its class. It includes a professional school of architecture, a school of engineering, a school for machinists, a school of technical chemistry—each comprising three years' courses; and a school of pharmacy, embracing two courses of one year each.

The number of professors and other teachers is 42, and, notwithstanding embarrassment is now felt, owing to the non-completion of new structures designed for its use, it numbers 300 to 400 students, and bids fair to rival ere long its flourishing neighbor at Carlsruhe. New buildings are just being completed at a cost of nearly 1,000,000 florins.

POLYTECHNIC SCHOOLS OF OTHER EUROPEAN STATES.

Other continental polytechnic schools are found in several of the European countries; as in Holland, where, within the past three years, a school has been founded at Delft, and is now receiving aid from the state to the amount of $37,700 per annum; in Belgium, in which country there are several schools of this type, though not bearing the usual name; in Westphalia and some of the other smaller German states; and in Spain and Portugal. But at present the schools of these countries are more limited in their sphere of influence than those of which an account is given above, and, so far as they relate to the purpose of this report, only serve to show how almost universally on the European Continent does the sentiment already prevail that a wider and more generous diffusion of a knowledge of the sciences, and of their applications to the practical arts, is essential to the progress of civilization.

GREAT BRITAIN.

Scientific and polytechnic education in Great Britain, for reasons which might be made to appear but which are not necessary to the objects of this report, has had comparatively less development within the past few years than on the continent. But even there very much has been accomplished. The keen criticism of many of the real statesmen of the United Kingdom upon the British system of education and upon the character of their leading institutions of learning, and their warning that, unless more attention be given to applications of science and of technical art, the glory of British supremacy in the leading branches of manufacture must pass to other countries—these have not been without results.

Polytechnic schools, distinctively so called, have not multiplied. But, under the form of schools of the arts; schools and academies of design; mechanics' institutes, museums, with halls in which lectures are given on various branches of applied science; universities for the working classes, such as the Andersonian University at Glasgow, in which workingmen and others have the advantage of regular courses of lectures on the sciences, and in the other departments of learning, by able men; learned and industrial societies, with fully organized systems of instruction by lectures and discussions, like those of London, Manchester, Dublin, Glasgow, and Edinburgh—under all these various forms do we find the work of polytechnic schools more or less efficiently performed. Nor can this be the end of development in the direction of scientific education in Great Britain. The Exposition of 1867 has added yet more than its predecessors to the argument of necessity, and her far-seeing statesmen and distinguished cultivators of science, thus strongly re-enforced, will be enabled to accomplish more within the next ten years than in any two decades before.

UNITED STATES.

Polytechnic schools in the United States, if the enumeration be limited to such as are distinctively so called, will number but three, to wit, the Massachusetts Institute of Technology at Boston, the Rensselaer Polytechnic Institute at Troy, New York, and the Polytechnic College of the State of Pennsylvania at Philadelphia. A brief notice of the first of these must represent the whole class in this connection.

The Massachusetts Institute of Technology, organized in 1862, and then and since endowed to the extent of nearly half a million dollars, embraces within its plan: 1. A school of industrial sciences. 2. A museum of arts. 3. A society of arts.

The objects of the institute, as set forth, are:

1. To provide a full course of scientific studies and practical exercises for students seeking to qualify themselves for the professions of the mechanical engineer, civil engineer, practical chemist, engineer of mines, and builder and architect.

2. To furnish a general education founded upon the mathematical, physical, and natural sciences, English and other modern languages, and mental and political science.

3. To provide courses of evening instruction in the main branches of knowledge above referred to for persons of either sex, who are unable to devote themselves to study during the day, but who desire to avail themselves of systematic evening lessons and lectures.

Candidates for admission to the school must have attained the age of sixteen, and are examined in arithmetic, plane geometry, elementary algebra, and such other English branches as are ordinarily taught in a high school or academy.

The regular courses of study extend through four years. Students may enter in advanced classes, but must, in such cases, have the same qualifications as to age, &c., as if they had entered at the beginning and reached the class or division where admitted in due order of study.

In the first two years the instruction is general, and common to all classes of students preparing for the technical courses, embracing, in general terms, the following branches:

First year. Algebra; solid geometry; plane trigonometry and its applications; mechanical drawing, and the commencement of descriptive geometry; free-hand drawing; elementary mechanics; chemistry, with manipulations; English language and literature, and French or German.

Second year. Continuation of same studies into the higher mathematics, with descriptive astronomy, surveying, and experimental physics.

The courses in the third and fourth year are technical, embracing the necessary continuations of the mathematical and other scientific studies, with their applications to the various scientific professions above enumerated.

At the completion of the respective courses special diplomas are conferred upon all who pass the required examinations.

The institute is already well provided with the means of illustration, demonstration, chemical analysis, &c., and is constantly increasing them.

But the three polytechnic schools first above enumerated by no means constitute the list of really polytechnic schools in the United States. The colleges of agriculture and the mechanic arts endowed by the congressional act of 1862, and already established in Brown University, at Providence; in the Sheffield Scientific School of Yale College, at New Haven; in Dartmouth College, at Hanover, New Hampshire; in the State University of Vermont, at Burlington; in the Cornell University, at Ithaca, New York; the Maryland Agricultural College, near Washington City; the Massachusetts College of Agriculture; the Illinois Industrial University; the College of Arts of the University of Wisconsin; the Iowa State Agricultural College, (and College of the Mechanic Arts,) in Story County; the College of Agriculture and the Mechanic Arts of Kansas; and the State Agricultural and Mechanical College of the University of Kentucky, at Lexington—all these institu-

tions have an actual existence, some of them with histories of a dozen successful years, and may be treated as the beginnings of so many polytechnic schools, while the State Agricultural, Mining, and Mechanical Arts College of California is about organizing, and twenty more similar schools are destined to be established at an early day in all the remaining States.

CHAPTER X.

SCHOOLS OF MEDICINE, LAW, AND THEOLOGY.

I.—Schools of medicine—The earliest schools—Italian schools—French medical schools—Schools in Austria and Prussia—Medical education in Great Britain—Brazil—Medical education in the United States—II. Schools of law—The earliest schools—Schools of the Latin nations—Italy—French, Spanish, and Portuguese schools—Brazilian schools—Schools of the Germanic nations—Scandinavian schools—Russian, Anglo-Saxon, British, and American schools—III. Schools of theology—The first Christian schools—Tabular view of schools of theology in Europe—Schools in France, Italy, German States, and other portions of Europe—Schools of theology considered as a class—Comparative courses of instruction.

I.—MEDICAL SCHOOLS.

Dealing, as it does, with the spiritual, no less than with the physical, laws and relations of man, it is not surprising either that medicine should have been one of the first and most honored of the professions, or that its development should have waited during those successive periods of centuries whose beginnings were marked by the shining names of medical history, as also by the founding of the great schools of Alexandria, of the Roman empire, and of modern Europe, for those signal discoveries of chemistry and microscopy which have at length furnished the foundations of a true medical science.

Untold centuries of dogmatism, then full two thousand years of empiricism, then at last the dawn of science—this has been the order of development. What a shortening of this long period there might have been had the Alexandrian school not been blotted out so soon after entering the pathway of systematic investigation, we can only conjecture; though it seems highly probably that the careful dissections of the human body there instituted, had they continued until they became common at the other great centers of science and philosophy, would have saved the world from at least a thousand years of slavery to the anatomical and physiological crudities of Hippocrates, Galen, and Avicenna—an assumption warranted not more by the known learning and spirit of investigation that reigned in those days at Alexandria than by the unmistakable evidences we find in Celsus's great work, ***De Medicina***, of the actual benefits derived by the ancient world from the discoveries made by the Alexandrian anatomists, notwithstanding the destruction, by Saracenic vandals, of all their written works.

But immediately following this period came the closing twilight, evening, and midnight of the Middle Ages, during which, except among the Arabians, who gave it refuge and fostering care, the only home of medical science was at Salernum, whose school, though great from the

eighth to the thirteenth century, and the only one in the world—at least the only one worthy of mention—was really but a taper-light in the midst of the thick darkness that enveloped all Europe besides.

At this school there were no anatomical dissections and no important investigations of any sort, its object being merely to give to its pupils a knowledge of the long-established authorities. Instruction was given by lectures, and the candidates for authority to practice were obliged to undergo an examination on the aphoristic teachings of Hippocrates, the therapeutics of Galen, the materia medica of Dioscorides, and the first book of Avicenna; to take an oath, pledging themselves to purity of life, obedience to the laws, gratuitous attendance upon the poor, and non-participation in the profits of the druggist. After successfully passing this ordeal, they were required to pass at least one year under the superintendence and direction of physicians of experience and acknowledged character, before attempting to practice on their own responsibility.

At length, with the Renaissance, the establishment of the great universities of France, Italy, Germany, Austria, and England, and the revival of investigation as a means, and the only means of positive knowledge, sprung up those great schools of medicine whose history embodies a record of almost every important step in the progress of medical science, and which are to-day, as they have been for more than five hundred years, the chief sources of light and of medical authority for all nations.

ITALY.

Just when Italy began the establishment of schools of medicine in the universities that date back to the twelfth, thirteenth, and fourteenth centuries, it is now hardly possible to say; but there seems good reason for assuming that at Bologna and Naples they were coeval with the universities there established, and that Italy was therefore first in the period of the Renaissance, as well as foremost in the former period of decline, to found institutions of this class.

For many generations the names of those cities, as well as of Padua and others, have been inseparably connected with the history of discovery and progress in medical science; and although the fountains there open more than five centuries ago are less frequented by the eager thousands who thronged the vast amphitheaters of those early times from all parts of Europe, these same universities are still medical centers and annually attract large numbers of Italian students to their halls.

At the present moment each of the twenty universities has its *facoltà di medicina e chirurgia*, except Urbino; which, however, in common with a majority of them, has its courses in veterinary medicine and in pharmacy, and even adds special courses in obstetrics and in blood-letting, (*corso di flebotomia.*)

The regulations for admission to the *facoltà* are of universal application,

and the same is likewise true of such state *regolamenti* as determine the course of instruction and the conditions of graduation.

The applicant for admission must present a certificate, showing that he has completed the studies of the lyceum, which are, in general, Greek and Latin literature, Italian literature, history and geography, philosophy, physics, chemistry, mathematics, natural history, mechanics, and gymnastics, and undergo an examination upon geometry, trigonometry, algebra, the elements of natural history, and Italian and Latin literature. The term of study is six years; the fees 280 lire (of about 19 cents each) for the entire course, or 46.66 lire for each year.

The distribution of studies in the several years of the course is substantially as follows:

First year. Botany; physics; inorganic chemistry; zoology and comparative anatomy; human anatomy; exercises in anatomical dissections and normal histology; botanical exercises, especially upon medicinal plants.

Second year. Physics; physiology; organic and physiological chemistry; human anatomy; exercises in chemistry, especially physiological chemistry, and in anatomical dissections.

Third year. Physiology; general pathology; exercises in physiology and in pathological histology.

Fourth year. Special medical pathology; special surgical pathology; materica medica and experimental therapeutics; hygiene; topographical anatomy; exercises in pathological and topographical anatomy; attendance upon the medical and surgical clinics.

Fifth year. Clinical medicine and clinical illustrations from the chair; clinical surgery with illustrations and discussions on the theory and practice of medicine; obstetrics and doctrine of the diseases of women and children; obstetrical clinics; ophthalmic diseases and ophthalmic clinics; pathological anatomy; exercises in pathological and topographical anatomy, and surgical operations upon the cadave.

Sixth year. Medical clinics and illustrations as in fifth year; surgical clinics and discussions upon the practice of medicine, with clinical illustrations, as in fifth year; special study of diseases of the skin for four months; special study of syphilitic diseases for four months; special study of mental diseases for four months; medical jurisprudence and toxicology; exercises in pathological anatomy and in legal medicine and toxicology.

Besides these several faculties of medicine and surgery in the universities, there are some special and independent schools of superior rank, such as the Royal College of Medicine and Surgery at Naples, the Medical College of Florence, and the Medical and Surgical School of the Royal Institute of Superior Practical Studies and "*Perfectionment*," at Florence.

The organization of the Royal College at Naples is peculiar, in that provision is made for the boarding and lodging of two hundred students

in the institution—the maximum nnmber of day students (*esterni*) being determined by the administrative commission of the college—and in the division of the whole body of students into four classes named for the particular portions of the general course of study, to wit: 1. Physical students. 2. Ante-practical students. 3. Practical students. 4. Surgical students.

The course in the college is more strictly professional in its earlier portions than that in the first year of the university faculties already described; but the students are obliged to attend the courses in physics, chemistry, botany, zoology, comparative anatomy, human anatomy and physiology, with the appropriate exercises, in the Royal University. Each *circondario* (division of the province) is entitled to a half-scholarship. The attendance at this institution is large, and its career seems to be in all respects successful.

The course of study in the medical and surgical section of the Royal Superior Institute at Florence is exclusively practical; being designed for such as, having laid the foundations of professional study at the schools of the faculties and other medical institutions, desire to complete their professional studies at the capital, where unusual facilities are furnished for the study of various classes of disease in the hospitals, as well as for instruction in some of the less generally taught applications of science.

There are also secondary schools of pharmacy and minor surgery, and of theoretical and practical obstetrics, at Aquili, Bari, Lucca, Catanzaro, and Milan.

As before remarked, nearly every medical school has, connected with it, a complete and independent course in pharmacy, (*corso chimico-farmaceutico*,) for the benefit of such as desire to engage in that subordinate branch of the profession. The term of study essential to the right to practice and the diploma of *farmacista* (apothecary or pharmaceutist) is four years; the studies of the course being, for the—

First year. Inorganic chemistry; botany; and mineralogy.

Second year. Organic chemistry; botany; pharmaceutical chemistry; natural history of medicaments; practical exercises in pharmaceutical chemistry and qualitative analysis.

Third year. Materia medica and toxicology; pharmaceutical chemistry; natural history of medicaments; practical exercises, as in the second year.

Fourth year. Practice for the whole year at a pharmacy in some public hospital, civil or military, or with a private pharmaceutist authorized by the minister of public instruction.

The price of tuition for the whole course is 152 lire. Admission is granted upon the presentation of evidence that the applicant has completed the studies prescribed for the *ginnasi*, (gymnasia of the kingdom,) as well as the three years' course in a *scuóla tecnica*, and upon passing a satisfactory examination, written and oral, in the Italian language, in Latin grammar, in the lower branches of mathematics, and in physics.

Of the numerous schools of veterinary medicine connected with the faculties in the universities at Naples, Bologna, Turin, Milan, and many other university cities, some account has already been given in a previous chapter.

Whether considered in reference to the number of the schools of high rank, the completeness of their courses of instruction, the great extent and value of many of the collections illustrative of anatomy—human, comparative, and pathological—of materia medica, and the other branches of medical study, or in reference to the distinguished ability and genius of many of their medical professors, Italy may fairly claim a leading place in the world of medical science. And yet, it is nevertheless true, that even here she shows unmistakable traces of that restraining, cramping, and repressing influence so long imposed by her political and religious institutions upon the intellectual energies of the people. With the spirit of progress lately awakened, it is reasonable to anticipate an advancement in this profession—already, with jurisprudence, in the lead in that country—corresponding to the marked taste and genius always manifested for it by the Italian mind.

FRANCE.

French medical science and medical schools may be said to have had nearly, if not quite, simultaneous origin with Italian; the first school—medical faculty of the University of Paris—dating back to the year 1274. And although the French mind has always been characterized by a special fondness and genius for mathematical studies, its tendencies toward, and its success in, the study of all those natural sciences which underlie the comprehensive science of medicine have been scarcely less remarkable. It is not surprising, therefore, that so many of the prominent names of medical history belong to France. She has earned the high position she holds in this profession by trampling under foot every form of pretense and quackery and making thorough work, both by the systems of instruction instituted and the regulations adopted for insuring capacity and scientific qualifications on the part of those who enter the profession.

There, as well as in Italy, the medical schools are under the direction of the minister of public instruction; the ordinary faculties and schools, I mean, there being special schools of medicine and surgery for the military and naval services, respectively. The faculties are three in number—located at Paris, Montpellier, and Strasbourg—with a total of 61 professorships. Besides which, there are three superior schools of pharmacy, with 19 professorships, established at the same places, in connection with their medical faculties; and, in the larger cities in the different departments, over twenty preparatory schools, (*écoles préparatoires de médecine et de pharmacie,*) with 10 to 12 professors each.

The three superior schools are alone competent to confer the title of doctor; the diploma of the *écoles préparatoires* being that of health offi-

cer, (*officier de santé.*) In order to obtain the degree of doctor, which alone secures the privilege of full practice in medicine and surgery anywhere in the empire, it is necessary to have followed the courses of instruction in one of the great faculties during four full years, or the courses in an *école préparatoire* during three and a half years, and at least one annual course in a faculty of medicine; to have spent two years in a hospital near the faculty or preparatory school; to undergo three annual examinations, and five at the end of the studies, and to present a satisfactory thesis. The fees amount, in the aggregate, to 1,260 francs. But this account only shows the way out of the French schools when once entered by the ambitious student. In order to gain admission the applicant must, at the time of inscription, show his diploma as bachelor of letters, and, even then, he is not permitted to take the third annual course of lectures unless able, by that time, to present the diploma of bachelor of sciences *restreint*, that is, with limitations—in this case, only on the side of mathematics.

It is owing to this superiority of preparation in the departments of letters and science that the term of study is limited to four years in France, instead of six, the period in Italy, where, it will be remembered, the student is permitted to enter with the *licenza liceale*, and is, therefore, required to spend a large proportion of his time during the first two years in studying the physical and natural sciences; after which period of two years, the studies of the French and Italian courses are quite the same.

For example, the *faculté de médecine*, at Paris, comprises the following departments, to wit: Anatomy; pathological anatomy; physiology; medical physics; hygiene; materia medica and therapeutics; medical chemistry; medical natural history; histology; surgical pathology, (two professors;) medical pathology, (two professors;) pathology and general therapeutics; operations and apparatus; surgical clinics, (four professors;) obstetrical clinics; medical clinics, (two professors and two substitutes;) accouchements, and diseases of women and children; legal medicine; and pharmacology.

Besides these twenty-five professors, there are honorary professors, who deliver occasional lectures to examiners (*agrégés*) charged with courses complementary of the clinics embracing diseases of children, and ophthalmia, and twenty-five *agrégés* in the discharge of their ordinary functions.

The diploma of *officier de santé*, which entitles the holder to practice anywhere in the department where certificated, but limits him in surgery to the minor operations, except it be in the presence and with the consent of a doctor, is obtained at the end of three years' study in a faculty, or three and a half years in a preparatory school, with two years' practice in a hospital, five regular examinations, and an acceptable thesis. Twenty-one years is the minimum age.

The conditions for admission to the courses of study having this

diploma in view are, sixteen years of age past, and a *certificat d'examen de grammaire*—a certificate indicating about the proficiency in Latin, Greek, some living language other than French, mathematics, history, &c., required of pupils who pass from the fourth year of the *lycées*. The fees for the full course, examinations, and diploma are 840 francs in the faculties, and 780 in the *écoles préparatoires*.

Such is the provision made by France for the preparation of physicians and surgeons for ordinary practice. They certainly show an intelligent appreciation of the great importance of thoroughness of qualification on the part of those to whom the care of the public health is intrusted, and it is no wonder, therefore, that there, too, as in Italy, the law severely punishes those who attempt the functions of the medical profession without the authority of the schools.

But yet further provision is made by strict regulations for the apothecaries who deal out the medicines prescribed; making it penal for them to do so without being possessed of a *diplôme de pharmacien*. This diploma is of the first and second grade; the first being good anywhere in France; the second anywhere in the department of the empire chosen by the pharmaceutist on receiving it. Both classes of the diploma may be obtained in either of the three superior schools of pharmacy above referred to, and the diploma of second grade may be obtained at one of the preparatory schools of medicine and pharmacy without attending a superior school.

For a first-class diploma, the aspirant must first have been provided with the diploma of *bachelier ès sciences;* and subsequently have completed three full years of study in a superior school of pharmacy, or two and a half years in a preparatory school and one year in a superior school; have spent, since he was sixteen years of age, three years in a legally established pharmacy; have undergone five semi-annual examinations and three final examinations upon chemistry, physics, toxicology, pharmacy, botany, zoology, mineralogy, and medical natural history; and have attained the age of twenty-five. The total of the fees amounts to 1,390 francs.

The *diplôme de pharmacien* of second grade is conditioned on the primary possession of the *certificat d'examen de grammaire;* the completion of one year's course of study in a superior school, or one year and a half in a preparatory school; six years' practice in an authorized pharmacy, outside the term of study; and five satisfactory examinations, the last three on chemistry, physics, and toxicology, and at the minimum age of twenty-five years. The cost of this diploma, all told, is 660 francs.

Diplomas are also provided for gatherers, preservers, and preparers of medicinal plants. These are also of two grades; the first obtainable only at a superior school of pharmacy, and good throughout France; the second at a preparatory school, and good only in the department for which received. Women are eligible to these diplomas. Neither age, nor period, nor place of study is a requisite condition; but the

candidate must pass an examination bearing upon the knowledge of medicinal plants, the precautions necessary to their gathering, their drying, and their preparation for the druggist. The cost of examinations and of the *diplôme d'herboriste* is 80 francs.

A *diplôme de sage-femme* is provided for women of capacity and reproachless lives, between the ages of eighteen and thirty-five, who establish, before a faculty of medicine, in a preparatory school, such knowledge, scientific and practical—the practical knowledge having been acquired at a lying-in hospital—in relation to accouchements, as renders them competent accoucheurs in ordinary cases, or attendants upon the sick in such cases as are in charge of regular physicians.

But the army and navy demand certain important special qualifications on the part of physicians and surgeons who would practice therein; and, accordingly, the government of France has established, and placed under the control of the minister of war and the minister of marine and of colonies, schools of medicine and of pharmacy, especially designed to meet that want.

The imperial schools of military, medicine, and pharmacy are two in number—a preparatory school, located at Paris, in connection with the superior schools of medicine and of pharmacy, and a school of application, at Paris, in connection with the military hospital of Val-de-Grâce. The preparatory school, *École Impériale du Service de Santé Militaire*, provides a four-years' course of study in medicine and a three-years' course in pharmacy, and leads to the school of application. Admission is possible only to such as have succeeded at a competitive examination instituted by order of the minister of war, and are able to present the two diplomas of bachelor of letters and bachelor of science limited, or the diploma of bachelor of science, according as the candidate proposes to prepare for the medical or the pharmaceutical service; evidence of being between the ages of seventeen and twenty; a certificate of capacity for active military service; and an engagement to serve in the health department or the pharmaceutical service of the army for ten years. This done, the candidate is examined in a manner designated by the minister, and, if passed, enters the school not only as a pupil of medicine or of pharmacy, as the case may be, but as a member of the family of the institution; paying 1,000 francs per annum for board, and a certain sum, fixed each year, for clothing. Tuition, examinations, and the diploma are free stipends, and half-stipends are provided for such worthy pupils as are without the means to pay for their boarding and wardrobe.

The School of Application, *École Impériale d'Application de Médecine et de Pharmacie*, at Paris, was designed to initiate the graduated pupils of the preparatory school and such doctors of medicine as are found qualified to enter the school, in the special exercise of the medical and pharmaceutical arts in the army, to complete their practical education, and to familiarize them with the regulations which govern the army in their

relations to the health-service. Doctors of medicine and pharmaceutists who would enter this school must show that they are natives or naturalized Frenchmen; that they are under twenty-eight years of age; that they have bodily capacity for the active military service; and must engage to continue in the service five years and undergo two examinations to prove their superior qualifications—the first, a public competitive examination, in the place where opened by the minister, from time to time, as the needs of the service demand; and the second, a special examination by the officers of the school, upon anatomy, medical pathology, and therapeutics, and upon practical surgery, if doctors; and upon the natural history of medicaments, materia medica, chemistry, and pharmacy, if pharmaceutists. No provision is made in this school for the boarding and lodging of students; but tuition and all else is free; and besides, during their stay at the school—which continues until they are called into actual service—each student receives pay at 2,160 francs per annum and an indemnity of 500 francs for clothing. After having been in the school one year they are examined, and if found qualified for service, they receive the brevet of *médecine aide-major* of the second class, or of *pharmacien aide-major* of the second class.

The imperial schools of naval medicine and pharmacy are three in number, located at Brest, Toulon, and Rochefort, in connection with the great marine hospitals at those places. The instruction is permanent and gratuitous, and all the libraries, botanical gardens, anatomical amphitheaters, &c., are freely open to the students. The conditions of admission are quite the same as for the military school last mentioned, except that the minimum and maximum ages are eighteen and twenty-three years respectively.

From this glance at the magnificent system of medical instruction in France, let us turn to some of the Germanic countries and see what they are doing in this department.

AUSTRIA.

The Austrian system of medical schools is worthy of a place side by side with that of France; for though cast in a somewhat different mold, in all essential respects the general features are the same. The leading schools are found in connection with the universities at Vienna, Prague, Gratz, Innsbruck, Olmutz, Lemberg, and Cracow. There are also schools at Klausenburg and Salzburg, besides schools of pharmacy and veterinary science and special obstetrical academies in considerable number.

To attempt the practice of medicine, surgery, obstetrics, or pharmacy without the evidence of educational fitness is a penal offense.

The certificate of the gymnasium (*Abiturienten-examen*) is a *sine qua non* of admission to any of the medical schools, and a four years' course of study, confined almost exclusively to branches strictly speaking profes-

sional, is requisite to admission to the final examinations necessary to be passed by all candidates for the doctorate.

The greatest school of medicine in Austria, and, in some respects, the greatest in Europe, is the *medicinisch-chirurgische Facultät* of the Royal University in Vienna. I shall be pardoned, therefore, for occupying the principal portion of the space assigned to medical education in Austria with a general account of the condition in which I found it in 1867.

The whole period of study is divided into ten semi-annual courses; the general departments of study, and the order of them, as recommended to students, (the order is not obligatory,) being as follows:

First semester. Zoology; mineralogy; chemistry; descriptive anatomy; anatomical exercises; anatomy of plants; lectures on zootomy.

Second semester. Plant-morphology and systematic botany; chemistry; descriptive anatomy; lectures on medicinal plants, preparatory to the study of pharmacognosy.

Third semester. Dissections; topographical anatomy; physiology; general pathology; pharmacognosy; prescriptions; instruments and bandages.

Fourth semester. Topographical anatomy; physiology; pharmacology; prescriptions; surgical apparatus and use of bandages; preliminary study of climatology; percussion and auscultation.

Fifth semester. Pathological anatomy, with practical dissections; theory of surgical operations; surgical clinic; medical clinic; medical jurisprudence and legal dissections; courses on pathological anatomy and physiological and pathological chemistry.

Sixth semester. Pathological anatomy, with dissections; science of operative surgery; surgical clinic; medical clinic.

Seventh semester. Medical clinic; medical jurisprudence and exercises in legal dissections; clinic for ambulant patients, and clinic for diseases of the eye; instruction in vaccination; obstetrical clinic.

Eighth semester. Surgical clinic; medical clinic; obstetrical clinic.

Ninth semester. Surgical clinic; medical clinic; descriptive anatomy; practice in dissecting; topographical anatomy; physiology.

Tenth semester. *Ambulatoreum*, and clinic for diseases of the eye; descriptive anatomy; topographical anatomy; physiology.

The instruction in the several departments of study is given by 35 full professors, 19 assistant professors, and 39 *Privat-docenten;* all of whom give numerous lectures and demonstrative exercises during each semester. To convey some idea of the range and amount of instruction by this the largest corps of medical teachers connected with any single institution of the kind in the world, I present a complete list of courses in which lectures and demonstrations were given during the winter semester of 1867, together with the number of hours per week devoted to each:

TITLES OF COURSES BY FULL PROFESSORS.—Medical hodegetics, five hours each week; descriptive anatomy, five hours; topographical anat-

omy of the neck and trunk, four hours; comparative anatomy of the vertebrate animals, one hour; dissections, five hours; descriptive anatomy, (the viscera,) three hours; comparative physiology, five hours; physiology and higher anatomy, five hours; practical histology, five hours; pharmacognosy, three hours; general pathology, five hours; general therapeutics, two hours; toxicology, three hours; general pathological anatomy, five hours; pathological dissections, three hours; pathologico-anatomical diagnostics, with demonstrations, three hours; special medical pathology, therapeutics, and clinic, five hours each, by two professors; surgical clinic, with lectures upon special surgical pathology and therapeutics, five hours each, by two professors, and three hours by a third; surgical operations, three hours each, by two professors; orthopedy, five hours; operations on the bladder and generative organs, two hours; theoretical and practical instruction in diseases of the eye, two hours daily; special pathology and therapeutics of eye diseases, with clinic, two hours daily; theoretical and practical instruction in operations upon the eye, and in the proper use of eye-glasses, five hours; clinical lectures on the special pathology and therapeutics of eye diseases, five hours; surgical instruments and the dressing of wounds, two hours by one professor and three hours by a second; dental instruments and dental operations, in four to six weekly courses; legal medicine and practical exercises in legal dissections, seven hours; resuscitation of persons seemingly dead, and rescue from sudden accidents, two hours; obstetrical clinic, and theoretico-practical instruction in obstetrics, five hours; gynecological clinic, with lectures upon the female sexual organs, five hours; obstetrical operations, with demonstrations, one hour; theoretical obstetrics, one hour; history of medicine and epidemiology, four hours; clinic for diseases of the skin, five hours; diseases of the skin, five hours; clinic for syphilitic diseases, in eight weekly courses; theoretical lectures on the diagnosis and management of syphilis in general, five hours; clinical lectures on special pathology of the diseases of children, five hours.

By extraordinary professors and Privat-docenten: The theory of human malformations, two hours; course on eye-glasses, five hours; anomalous refractions and disturbed movements (*Mobilitätsstörungen*) of the eyes, six hours; dioptrics of the eyes, with introductory lessons on physical optics, three hours; systematic instruction in the treatment of the eyes, four hours; diagnosis of diseases of the eye, two hours; operative obstetrics and gynecology, five hours each, by two lecturers; diseases of the skin, two hours each, by two lecturers, and five hours by a third; diseases of the skin, and syphilis, with demonstrations, five hours; syphilis, together with differential diagnosis of syphilitic and non-syphilitic diseases of the skin, illustrated by cases, two hours; polyclinical lectures upon diseases of children, five hours; diseases of infants, particularly of newly born infants and sucklings, three hours for six weeks by one lecturer, and three hours by a second; theoretical and practical lectures

upon special medical pathology and therapeutics, five hours; medical climatology, four hours for two months; auscultation and percussion, five hours; percussion and auscultation, with the diagnosis of lung and heart diseases, five hours; pathology and therapeutics of diseases of the head, two hours; laryngoscopy and rhinoscopy, as well as diseases of the head, the throat, and the windpipe, three hours by one lecturer, and five hours by another; operative dentistry, two hours; operative dental surgery, with clinical demonstrations, three hours; clinical lectures on practical psychiatry, three hours; theoretical and practical psychiatry, three hours; theory and treatment of insanity, two hours by one lecturer, and three hours by another; practical discussion of diseases of the ear, five hours for five weeks by one lecturer, and five hours for five weeks by a second; electrotherapy, five hours in six weeks, and four weeks' courses, by two lecturers; homœopathic clinics, six hours; hydrotherapeutics, with practical demonstrations in the imperial baths, five hours in four-weeks' courses; healing waters in general, with special reference to the physiological and therapeutical value of Austrian mineral springs, two hours; treatment of chronic diseases of women with mineral water, three hours; clinical propædeutics, (practical course,) three hours; theoretical propædeutics, two hours; diagnostic exercises by the sick-bed, pathology and therapeutics of the central and peripheral nervous systems, five hours; lectures and demonstrations upon the structure and connection of the brain and back, in their relation to the falling sickness, six hours for six weeks; physiological and pathological chemistry and microscopy, five hours for six weeks, and three hours during remainder of semester; practical exercises and demonstrations in physiological and pathological chemistry and microscopy, qualitative and quantitative analysis, and animal chemistry, six hours; practical instruction in vaccination, two hours.

Here we have a grand array of nearly a hundred courses of lectures and practical exercises running through the whole, or a considerable portion, of the half-year, and comprising, in the aggregate, not less than nine thousand lessons of one hour each in every branch of medicine, and nearly every disease within the range of medical practice; and this is but one of the ten semesters through which the student is to pass on his way to the doctorate, the only door of entrance to the medical profession.

But even this is not the total of the facilities afforded by this magnificent institution. The collections, museums, libraries, laboratories, botanical gardens, &c., constitute a no less remarkable array of material aids; while the general hospital, with its numerous divisions for all the important classes of disease, its thousands of beds, and superior facilities for a dozen or more distinct clinics, on a large scale, surpasses all other hospitals in the world.

Owing to the liberal support of the government, and the large number of stipends derived by the university from some seventy-five special foundations, in which this faculty has a share, tuition in some depart-

ments is entirely gratuitous, and in others so moderate as to be but a slight burden upon the student of even slender resources. The fees for the optional courses, by the thirty-nine or more able and learned *Privat-docenten*, range between $3 and $6 per semester. Admission to all departments of the hospital is free to all matriculated students. The fees required of the candidate for the doctorate, for examinations, diplomas, &c., are 180 florins, (of about 50 cents each;) of the candidate for admission to surgical practice, (already of necessity a doctor,) 100 florins. Special diplomas are granted in dentistry, pharmacy, obstetrics, veterinary science, &c., conferring, for the most part, the title of master. The number of medical students in attendance upon this faculty, in 1867, was over 900; of whom 91 were graduated in medicine, 50 in surgery, and 55 in pharmacy.

With so strong and brilliant a light as this great institution blazing at the imperial capital, it may be inferred that no portion of Austria is left to grope in total medical darkness.

PRUSSIA.

Medical education in Prussia rests so nearly upon the same basis as in Austria, that I shall omit all details concerning it. Of course, Berlin is the great center; but there are also important faculties in the universities at Halle, Königsberg, Greifswald, Breslau, Gottingen, and Bonn. The conditions of admission to the faculties and to the practice are quite identical with those of Austria.

The *medicinisch-chirurgische Facultät* of the Royal Frederick-William's University, at Berlin, has made rapid growth within the past quarter of a century; and even now, in the number of its learned and distinguished teachers, ranks with the school at Vienna. It is also provided with extensive facilities in the way of collections, laboratories, and hospitals. There are, at present, 98 doctors giving the instruction there furnished; of whom 33 are full professors, 26 extraordinary professors, and 39 *Privat-docenten*. An enumeration of the courses of lectures given by this army of professors and teachers during the winter semester of 1867 will be found in the chapter on universities further on.

OTHER CONTINENTAL COUNTRIES.

Other continental countries likewise afford interesting illustrations of the importance attached by the most enlightened governments to the applications of science to the healing art; but a special account of their schools is deemed unimportant, after the somewhat lengthy notice already given of the institutions belonging to the four nations which have the lead in this profession.

From personal observations I am able to speak in high terms of the faculties of Saxony, Saxe-Weimar, Bavaria, Wurtemberg, Baden, Belgium, Netherlands, Denmark, Sweden, and Russia. I was particularly impressed at Munich with the extent and great value of the facilities

afforded by the physiological institute, the laboratory for physiological chemistry, and the pharmaceutical institute for the study of those fundamental and auxiliary branches of medical science; as also at St. Petersburg, with the superior advantages for clinical instruction offered by the extensive array of hospitals of various kinds located in the medical quarter of that imperial city.

GREAT BRITAIN.

Great Britain, though, until within the present decade, seriously deficient in the matter of a uniform system governing medical education in the kingdom, and still at fault, as it has seemed to me, and is acknowledged even by English critics, in the incompleteness of the foundation for scientific pharmacy, is nevertheless fully entitled to a place high on the roll of honor. Early among the nations to establish schools, and always somewhat exacting in her demands upon the professors, England has not failed of furnishing a fair proportion of the discoveries and scientific works that have contributed to make medicine as useful and honorable as it is old in time and necessary to mankind. To have given but two such names as Harvey and Jenner to the catalogue of discoverers and benefactors of the race, would have alone commanded the benedictions of civilized nations in all subsequent ages; but, not content with these, she has added others, and yet others, to the list of distinguished physicians, surgeons, and authors, until the pages accorded to her by the medical historian are luminous with great names.

One or two of the British schools date back to the sixteenth century, but a majority have had their origin since the year 1800. The number of such as are recognized by the highest professional authorities is 36—considerably larger than in either France or Italy, and probably twice as large as in any of the other European countries: 23 of these recognized schools are English, 13 of them being located at London, and the others at the following provincial towns, to wit: at Birmingham, 2; and at Bristol, Hull, Leeds, Liverpool, Manchester, Newcastle-upon-Tyne, Sheffield, and York, 1 each; 4 of the 36 are Scotch, located, 1 at Edinburgh, 1 at Glasgow, and 2 at Aberdeen; and the remaining 9 are Irish, being established, 6 at Dublin, 1 at Cork, 1 at Belfast, and 1 at Galway.

Besides the foregoing, there are the nominal schools in connection with Oxford and Cambridge Universities, the Military Medical School at Netley, the medical department of Anderson's University at Glasgow, and a considerable number of hospitals in which more or less complete courses of instruction are given, though not enough to warrant such scientific bodies as the Royal College of Surgeons of England in allowing them to certificate candidates for admission to examinations for membership. There is also at London the School of Pharmacy and the Royal School of Veterinary Surgery. Adding all these to the others, and we have a total for the United Kingdom of some 50 medical schools.

Nor does this complete the enumeration of medical educational institutions and agencies. For among the most important of them all are certain incorporated bodies known as universities, colleges, societies, and halls, which, though no courses of instruction may be given within their walls, are nevertheless authorized to examine students who have studied elsewhere, and grant such certificates, licences, and degrees as they may adjudge them entitled to.

Belonging to this general class, there are for England the University of London, the Royal College of Physicians, the Royal College of Surgeons of England, and the Society of Apothecaries, all located at London; for Scotland, the Royal College of Physicians and the Royal College of Surgeons, at Edinburgh; the University of St. Andrews, and the Faculty of Physicians and Surgeons of Glasgow; and for Ireland, the Queen's University in Ireland, the King and Queen's College of Physicians in Ireland, the Royal College of Surgeons in Ireland, and the Apothecaries' Hall of Ireland, all located at Dublin.

The schools proper are divisible into such as grant degrees, and such as only give certificates of study. To the first belong the university schools in general; to the latter, hospital schools and most of the independent schools. The second class stand, therefore, in a relation somewhat like that of grammar schools to the degree-conferring institutions. They agree in giving instruction in the essential branches of medicine, namely: anatomy—general, descriptive, morbid, surgical, and comparative; botany; chemistry—general, medical, and practical; physiology; materia medica and therapeutics; principles and practice of medicine; principles and practice of surgery; obstetrics and the diseases of women and children; medical jurisprudence. To which some add courses in forensic medicine; experimental philosophy; histology; dental surgery, &c., one or several, as circumstances allow.

This second class of schools also agree in having a winter session and a summer session, which together occupy the entire year; in expecting students to follow the courses of study at least three years; and in charging, as fees for lectures, demonstrations, and hospital practice, £25 to £35 per annum, or £75 to £105 for unlimited study. Located either in direct connection with or in close proximity to large hospitals or infirmaries, they all afford excellent opportunities for practical study; while the considerable number of their professors—ranging from twelve to twenty—would seem to insure a fair degree of thoroughness in the instruction given. In many of the schools there are a few free or partly free scholarships, for the benefit of sons of professional men, or of gentlemen in a corresponding station in society, of reduced circumstances, together with various prizes in medals and money for superior proficiency in some department of study, or for highly meritorious reports, essays, &c.

The courses of instruction in the institutions having power to confer degrees differ from those in the foregoing only in that they extend

through a period of four years, and, in general, are given by a class of more eminent men, each confined to one individual branch named in the curriculum of study.

The degrees conferred in Great Britain are those of bachelor of medicine, (M. B.,) master in surgery, (C. M.,) and doctor of medicine, (M. D.) No one is admitted, as a rule, to the course of medical study in a university who has not either graduated in the arts, or is able to pass an examination in the elements of mathematics, the English and Latin languages, and in at least two of the following branches, to wit: Greek, French, German, higher mathematics, natural philosophy, logic, and moral philosophy. And in no case is a candidate for the professional examinations prerequisite to the degree of bachelor of medicine, or the degree of master in surgery, eligible to such examinations unless possessed of the general educational qualifications above named. Each candidate is also required to establish by certificates—

1. That he has been engaged in medical and surgical study for four years—the medical session of each year comprising at least two courses of not less than one hundred lectures each, or one such course and two courses of not less than fifty lectures each, (except clinical courses, in which the lectures must have been as many as two a week during the prescribed periods.)

2. That he has studied, during courses of not less than one hundred lectures, the following departments of medical science, to wit: Anatomy; chemistry; materia medica; institutes of medicine; practice of medicine; surgery; obstetrics, and diseases of women and children; two courses of obstetrics of three months each, or one course of six months; general pathology, or, in schools where no such course exists, a three months' course on morbid anatomy, with a supplemental course in practical medicine or clinical medicine; a six months' course in practical anatomy; practical chemistry, three months; practical obstetrics, three months, at a recognized lying-in hospital, or certificate from a registered physician of attendance on six cases of labor; clinical medicine and clinical surgery during courses of six months, or two courses of three months; medical jurisprudence, botany, and zoology during courses of not less than fifty lectures each.

3. That, for at least two years, he has attended the medical and surgical practice of a general hospital with not fewer than eighty patients, and with a distinct staff of physicians and surgeons.

4. That he has attended for at least six months, as an apprentice or otherwise, the outside practice of a hospital, or the practice of a dispensary, physician, surgeon, or member of the London or Dublin Society of Apothecaries.

5. That one of the aforesaid four years of study has been in the medical school of the university to which application for examination is made. Some institutions (University of Edinburgh, *e. g.*) also require that another of the four years of study shall have been either in the said university or in some other university authorized to grant degrees.

6. That he has, at date of application, completed his twenty-first year.

7. That he is, or at date of application will be, under no articles of apprenticeship to any surgeon, physician, or other master.

Thus qualified, the candidate may be received to examinations, both written and oral, first, on the elementary branches of medical science, such as anatomy, chemistry, botany, and materia medica; second, on advanced anatomy, zoology, comparative anatomy, physiology, and surgery; third, on materia medica and the strictly practical departments, including practical medicine, clinical medicine, clinical surgery, obstetrics, general pathology, and medical jurisprudence. A thesis on some medical subject is also required.

The examinations in the natural history branches and in practical chemistry are conducted, as far as possible, by actual demonstrations upon material placed before the candidates, and the examinations in the practical departments are conducted, at least in part, in the hospitals; candidates being required to test their knowledge by examinations and prescriptions. As a general rule, those whose study is in the university are examined in the branches of the first and second divisions above enumerated at the close of the second and third years of their course; but admission to examination on those embraced in the third or practical division cannot take place until the candidate has completed his fourth year. Should the candidate fail, he cannot be admitted again until the completion of another year, or the expiration of such period as the examiners may prescribe.

The degree of master in surgery can in no case be conferred upon a candidate who is not at the same time granted, or has previously received, the degree of bachelor of medicine. The ordinary examination and diploma fees are about £5 for each of the three divisions of the examination; in all £15 for the degree of bachelor of medicine. If the candidate should desire the degree of master in surgery, a further fee of £5 is required.

The degree of doctor of medicine is conferred upon candidates who have obtained the degree of bachelor; have spent, since their graduation, at least two years in attendance upon a recognized hospital, or in the military or naval medical service, or in medical and surgical practice; and are either possessed of the diploma of bachelor of arts from a recognized university, or have passed, either before their examination for the bachelor's degree, or at the time of said examination, or within three years thereafter, a satisfactory examination in Greek, in logic, and moral philosophy, and in at least one of the following subjects, to wit: French, German, higher mathematics, natural philosophy, and natural history.

The several learned and scientific bodies already enumerated under the titles of colleges of physicians and colleges of surgeons do not grant degrees proper, but they have authority to examine candidates and grant licenses on very nearly the terms and conditions above recited

as requisite for the degree of bachelor of medicine and master in surgery. The recipient is known as licentiate and is entitled to the general privileges of bachelors.

These colleges of physicians and surgeons have also at their disposal memberships and fellowships, which are only conferred upon persons of advanced attainments in medicine and surgery. Some of them also have authority to grant certificates of qualification in dental surgery and other special departments of practice.

The societies of apothecaries of London are bodies similarly constituted, with authority to grant certificates of qualification to practice as apothecaries; which, in Great Britain, means a very different thing from apothecary practice in America; for the British apothecary is not a mere dealer in drugs, as a merchant deals in goods, but a general practitioner.

Every candidate for the apothecaries' certificate must produce evidence—1. Of having passed a preliminary examination in arts, equivalent at least to the matriculation examination of the University of London, or the middle-class examinations of Oxford and Cambridge. 2. Of having served an apprenticeship or pupilage of not less than five years to a qualified practitioner. 3. Of having attained the age of twenty-one years. 4. Of good moral character; and 5. Of having pursued a course of medical study in conformity with the court of examiners; which, at present, embraces three full years of two sessions each, and includes the general branches of medical science taught in the medical schools, especial attention being also given to practical chemistry, forensic medicine, and toxicology.

Previous to 1858 great embarrassment was experienced by the profession in Great Britain, owing to the diversity of qualifications demanded by the different licensing and degree-conferring bodies and schools in different portions of the kingdom, as well as by the existence of numerous practitioners whose scientific preparation was inadequate to the grave responsibilities assumed. But an act of Parliament of that date, entitled "The medical act," and since improved by successive amendments, laid a broad foundation upon which there is now being built up the very complete and harmonious system of medical education imperfectly outlined above.

So long as there was no compelling power it was vain that the schools established their courses of instruction and invited all who would enter the profession to qualify themselves by thorough scientific study for their difficult and responsible duties. A few, prompted by just sentiments, would gladly avail themselves of the opportunities thus offered; but the many, so long as allowed to practice without qualifications, acquired only by the expenditure of time and money, would turn away from the proffer of science and satisfy themselves with the lowest grade of qualifications that would be tolerated by the public at large, so utterly incompetent to judge of relative degrees of fitness.

The medical act referred to regulates this whole interest by providing,

1. That every person, whatever his condition, rank, or title, who would practice in any department of the medical profession, shall be registered as such practitioner with the legal authority of his district.

2. That no person shall be entitled to recover any charge, in any court of law, for any medical advice or attendance, or for the performance of any operation, or for any medicine which he shall have both prescribed and supplied, unless he shall prove upon trial that he is registered under said act; and that no certificate of legal character given by non-registered practitioners shall be received.

3. That no person may be registered who is not certificated, licensed, or graduated by one of the legally authorized societies or collegiate bodies named in the act, and on the basis of qualifications I have already recited.

4. By placing it in the power of certain councils to determine the faithfulness with which the authorized schools and other corporations fulfill their respective offices as educators, examiners, and licensers, and to strike them from the authorized list if they fail to comply with the standard.

The execution of the law is intrusted to a general council of medical education and registration of the United Kingdom, composed of one person from each of the leading universities, colleges of physicians and surgeons, and apothecaries' societies of the kingdom, elected by each of them respectively; and six other members representing the three divisions of the kingdom, and nominated by the Queen, with the advice of the privy council. This general council has the power not only to enforce the law of registration, but to require the medical schools of every grade, issuing licenses or diplomas, to report the courses of instruction, rules of examination, and graduation, &c., from time to time, and, if it should desire to do so, it may send visitors and inspectors to the schools to examine into and report upon the efficiency of their management in the instructional departments. Should the council become satisfied that any given institution is below the proper standard as a qualifying medical school, it is required to report such school to the privy council, with which body rests the power to order a denial of registration to all subsequent graduates or licentiates therefrom until its courses of study and regulations shall have been made to conform with the requirements of the law.

Such, in outline, are the advanced systems of medical education in Europe. If less than perfect, who is to criticise their defects? Certainly no American writer, whatever the ideal he may have set up.

SOUTH AMERICA.

South American medical education is most favorably and very nobly represented by Brazil, which empire is the most advanced of the South American states, and which, as before remarked, was also the only one

of them represented in the educational department of the Paris Exposition.

There are in the empire two medical faculties; one located at the capital, and the other in the province of Bahia. Both are under the same governmental regulations, and both are in a flourishing condition, as reported by the Brazilian Commission, to whose officers I am indebted for the facts here presented.

The course of study extends through a period of six years, and embraces the following subjects: General physics, especially as applicable to medicine; chemistry; mineralogy; descriptive anatomy, with anatomical demonstrations; botany; zoology; organic chemistry; physiology; general anatomy; internal and external pathology; obstetrics and diseases of women and new-born children; topographical anatomy; medical operations; instruments; materia medica; therapeutics; hygiene; history of medicine; medical jurisprudence; pharmacy, with practice in the pharmaceutical laboratory.

There are also special courses for pharmacy and obstetrics respectively, the term of study in which is three years.

Each faculty possesses a chemical laboratory, a cabinet of physics, of natural history, of human and comparative anatomy, and of materia medica; also a surgical arsenal, a pharmaceutical laboratory, and access to large botanical gardens.

The instructional corps consists of 21 professors and 21 assistants, all of whom are appointed by the government after competitive examinations.

Admission to medical study in these faculties is only after an examination in the leading branches of a general education; candidates for a place in the courses strictly medical being examined in Latin, French, English, history and geography, rational and moral philosophy, arithmetic, geometry, and algebra to equations of the first degree; candidates for the study of pharmacy in French, arithmetic, and geometry. The annual and final examinations are rigid, and cover the whole ground of the medical course.

The diplomas conferred are those of apothecary, bachelor of medicine, and doctor of medicine; and no person is allowed to practice either pharmacy or medicine without such evidence of scientific preparation. Even foreign graduates of medical schools, with diplomas *viséed* by the Brazilian consul resident in the country where issued, must pass an examination by one of the imperial faculties before they are permitted to offer themselves for practice, except in the case of acting or retired professors from schools of medicine, recognized by the foreign government or governments, who are exempted from examination on presentation of certificates from the Brazilian diplomatic agents, or consuls residing in the country or countries where they have been professors.

In the faculty of medicine of the capital there were in attendance in 1865, 228 students; 183 in the medical course, and 45 in the pharma-

centical course. In the faculty of Bahia, the number inscribed was 173, of whom 151 were following the medical course.

The annual appropriation by the government in aid of the two schools is 211,770,000 reis, ($52,942 50.)

UNITED STATES.

In the United States we number many medical schools, and, first and last, there have stood at the head of them men of learning, genius, and eminent distinction. And so we have, also, in the ranks of the profession many physicians and surgeons of great ability and skill. But hardly any one who is familiar with the status of medical education among us will claim that either the distinguished professor, author, or practitioner has owed his success in any considerable degree either to the training of the schools or the *esprit de corps* of the profession; for the training is, for the most part, little more than a pretense, as compared with actual European or any reasonable ideal standard, and the *esprit de corps* has yet to be created.

A few of the leading institutions prescribe something in the way of general educational qualifications for admission to professional study; and require that the candidate for the degree of doctor of medicine shall have spent three years in the study of medicine, including attendance upon two courses of lectures. The vigorous and progressive University of Michigan, going beyond the others, demands, as a condition of admission, a proper knowledge of the English language and a respectable acquaintance with its literature and with the art of composition; a fair knowledge of the natural sciences and of elementary mathematics, including algebra and geometry; and such a knowledge of Latin as will enable the applicant to read current prescriptions and appreciate the technical language of the natural sciences and of medicine. But most of the schools require nothing whatever in the way of general education, not even the ability to write or speak the English language with tolerable correctness; demand no evidence of a preliminary study of the profession, and are content to let their students bear away the diploma of doctor after two rather brief courses of lectures, and these, not unfrequently, in immediate succession and occupying, both together, less than nine full months.

But even this is not the worst of the case; for a little science is better than no science at all, and a great number of the practitioners now intrusted with the sacred guardianship of the public health never saw the inside of a medical college. In but few of the States is there any regulation demanding professional qualifications of those who assume to practice, and the people are accordingly the victims of the most outrageous and lawless quackery on every hand.

It is because of this deplorable and shameful condition of things in the United States, that I have presented at so great length an account of medical education in five of the leading European countries. The

few words I have said of its condition in this country are not flattering to American pride; but they are true, and ought to be patiently heard with good effect by every friend of his country and kind. If our people and the State and national governments could, for once, fairly get rid of the notion that we are a little in advance of all other nations in every sort of thing, and, when in that mood, look as learners at the wiser action of the governments above noticed, and so profit by their example, there might be an earlier escape from the condition of semi-barbarism in which, in respect of medical education at least, our country yet remains.

II.—SCHOOLS OF LAW.

Though the Roman Empire has lain for centuries in the tomb of departed nations, yet are all the civilized peoples of to-day under Roman rule through Roman law. Other nations had developed systems of law, but none of them possessed that happy combination of genius for organization and government, with that comprehensiveness of grasp, those larger ideas of justice, and that disposition to look on all sides of a question of rights, which could only come of vastness of empire with a consequent necessity for harmonizing many conflicting interests, and which alone could give capacity for the determination of universal principles and the construction of enduring systems of jurisprudence.

But the Romans were not only originators, digesters, and imposers of law; they were also the first systematic teachers of law by means of established schools; the professorships of law in the Auditorium established by Constantine the Great, at Constantinople, in the fourth century, and the law school founded by Theodosius, at Bologna, in the succeeding age, being notable instances of schools of law at that early day. During the darkest period of the night of the next succeeding centuries we hardly know with certainty what was done in such of the schools as remained; but almost the first dawn of the Renaissance in Italy reveals the Bolognese school still at its work, and the learned Irnerius and Gratian teaching the Roman and the canon law under the inspiration of the presence, at the university, of thousands of eager students, gathered from all the countries of Europe.

It is by the Latin nations, moreover, that law is taught and studied with most patience and thoroughness at the present moment. In all of them it has a department in nearly every university, with a course of study in no case less than four and generally five years in duration, and with numerous and able professors.

ITALY.

In Italy, for example, there are twenty-one faculties *di giurisprudenza*, with an average of fifteen full professors, and often several honorary and extraordinary professors, and each with an imperative course of five years requisite to the degree of doctor, and, moreover, with the provision that

no applicant shall be admitted to the courses, even though he should only aim to qualify himself for the licientiate, which requires four years' study, or merely for the office of notary public, unless possessed of the *certificato di licenza*, (equivalent to an American A. B.,) and able to pass an oral and written examination upon Italian and Latin literature, ancient and modern history, and moral philosophy.

The obligatory instruction for the several years of the course is precisely the same in all the faculties, being fixed by imperial decree, to wit:

First year. Introduction to the study of juridical science; history of law; institutes of Roman law; and comparison of the Roman with the law of the country now in force.

Second year. Roman law; institutes of canonical law; civil law and civil code; penal procedure.

Third year. Roman law; the civil code; criminal law and criminal procedure; civil procedure and order of trial.

Fourth year. Civil code; commercial rights; political economy; constitutional law; international rights, public, private, and maritime.

Fifth year. Commercial law; political economy; international rights, public, private, and maritime; philosophy of law; administrative rights; medical jurisprudence.

In addition to this general obligatory course, in many of the faculties there are special courses, by honorary professors, on various subjects for such as have time to attend them; as, for instance, on political geography, social statistics and social science, the codes of other nations, &c. At the conclusion of the first three years of study, such as have mastered all the studies embraced may receive the degree of bachelor in law; at the end of the fourth year, the degree of licentiate; at the end of the fifth year, the diploma of doctor.

As a means of encouraging protracted and thorough study, the government mainly supports the faculty; requiring of students merely the nominal sum of 410 lire, (about $78,) for the entire course of five years, and this payable in five equal installments. With such terms, with the necessity for a degree in order to admission to the courts, and with that fine *esprit de corps* that naturally comes of thorough scholarship in the profession, coupled with the prestige of a former unequaled greatness and glory, it is hardly a wonder that so large a proportion of the ambitions young men of the Italian states who enter the universities devote themselves to the study of the law.

FRANCE.

In France, legal instruction is also under control of the state; the minister of public instruction having it in special charge. Besides the great *faculté de droit* of the Academy of Paris, in which there are six chairs for the Code Napoléon, four chairs for Roman law, a chair of criminal legislation and civil and criminal procedure, a chair of civil procedure, one of criminal law and penal legislation compared, one for the code

of commerce, one of administrative rights, one for the law of nations, one for the history of the Roman and the French law, one for French law, studied in its feudal origin and customs, and one for political economy. Beside this great school, there are ten other faculties connected with as many of the remaining fifteen academies, in different parts of the Empire; each with two professors of Roman law, three of the Code Napoléon, and one or more each for the other essential departments of study. The full term of instruction in all the faculties is four years.

The French degrees in law are the same as in Italy, and the general regulations governing admission, &c., are similar. No person is admitted to the courses prescribed for any degree whatever unless a graduate in the arts. Thus qualified for study, the candidate for the degree of bachelor, which only admits the possessor to a solicitor's practice, must complete the courses of the first two years, and undergo two examinations; the first in the Institutes of Justinian, and the second in the Code Napoléon, the penal code, and the codes of civil procedure and of criminal instruction.

The student who desires the degree of licentiate, the lowest grade of diploma that will admit him to the barrister's or advocate's practice, must first have received the degree of bachelor, have completed the third year's course of study in a faculty of law, have taken four inscriptions, submitted to two examinations—the first in the Code Napoléon, the second upon the codes of commerce and of administrative law—and defended a thesis bearing on questions of Roman and French law.

To obtain the degree of doctor in law, it is necessary to be a licentiate, to take four inscriptions, and to complete the four years' courses of study; to undergo two examinations upon the Roman law, the law of nations, a searching examination upon the French civil law, French law studied in its feudal sources, the history of law, and to sustain a thesis comprising two dissertations—one upon Roman law, the other upon French law. To these two dissertations there must also be joined at least four propositions upon the history and the difficulties of the Roman law; three upon the history and the difficulties of the French civil law; two upon criminal law; and two upon the law of nations or other branches of public law. The degree of doctor is an essential qualification for admission to the competitive examinations which constitute the door of entrance to the honorable position of professor in a faculty of law.

The cost of the bachelor's diploma, including tuition and examinations, is 630 francs; of each of the subsequent higher degrees, 600 francs.

For such persons as design merely to practice in a subordinate capacity, as mere solicitors, notaries public, &c., a *certificate de capacité en droit* is granted at the end of one year's study, embracing the first and second years' courses in the Code Napoléon and the codes of civil and criminal procedure; the expense being but 285 francs.

The Spanish and Portuguese regulations closely resemble those of Italy and France, as likewise do those of the most of the Latin nations of South America.

The faculties of law in Brazil, to which country I have several times already had occasion to refer, in evidence of the high standard of education there established, afford a very interesting illustration of this statement. They are two in number, located at the capitals of the provinces of St. Paulo and Pernambuco. Both are under the same imperial regulations and are largely aided by the state—the annual appropriation amounting to $38,827—in order that the expense of thorough legal education may be no impediment in the way of poor young men of genius.

For the benefit of such persons as may not be able to enter at once upon professional study, a preparatory course has been established in connection with each of the faculties, for instruction in French and English languages and literatures, Latin, arithmetic, geometry, history, rhetoric, and philosophy. The professional course occupies five years, the very full and complete programme comprising lectures and exercises given and directed by eleven professors in each faculty and eleven substitutes; the two degrees conferred are those of bachelor and doctor, the first being attainable after the completion of the third year's course, and conferring the privileges of the magistratic career or of the professional advocate, and the last only at the end of five years, and after an examination on the studies of the entire five years and the defense of a thesis upon each department of law included. No one can be a professor unless possessed of the degree of doctor of law thus acquired, and not then unless the successful contestant in a public competitive examination.

In 1865 the number of students in the preparatory course of these two faculties was 732; in the professional or superior course, 815.

GERMANIC STATES, SCANDINAVIA, RUSSIA.

In the Germanic States, law is also ably and successfully taught in nearly all, if not every one, of the universities. More exactly, the number of faculties of law is 34; the total number of professors, including a score of professors of political economy whose courses are not an essential part of the faculties, being 295. Of these faculties, nine are Prussian, with a total of 83 professors; four are Austrian, with 74 professors; 12 are Bavarian, (three being parts of complete universities, and nine being incomplete courses of political economy and studies preparatory to the profession of law,) with 41 professors; one is Saxon, with 22 professors; one, with nine professors, (besides which there are seven professorships of political economy,) belongs to Wurtemberg; two, with 19 professors, belong to Baden; one, with eight professors, to Hesse Darmstadt; one, with five professors, to Mecklenburg-Schwerin; one, with 11 professors, belongs to Saxe-Weimar; one, with nine professors,

to the Electorate of Hesse; and one, with seven professors, to Holstein.

To these lists of professors, as constituting the instructional corps, it is also necessary to add a larger number of *professores extraordinarii* and *Privat-docenten*, who crowd in great numbers about the faculties, and many of whom are among the ablest lecturers in Germany.

An illustration of the mode in which law is taught in the German faculties will be found in a list of subjects taught during the winter semester of 1867 in the *Rechts- und Staatswissenschaftliche-Facultät* of the great Frederick William's University at Berlin.

The term of study requisite to the degree of doctor—the only one conferred—is four years of two semesters each. The *Maturitäts Zeugniss*, (answering to our degree of A. B.,) granted by the gymnasia of Germany, is requisite for admission, and the student is also expected to attend certain lectures in the faculty of philosophy. The price of tuition in some departments is nothing, the professors being paid by the government; in others it is so much for each course of lectures per semester, averaging about four dollars.

Schools of law in the Scandinavian states are neither numerous nor provided with large corps of professors; though I have found few in which the instructors appeared more able and zealous. Being a little later in origin than those of Germany, they show many marks of the influence of the German examples set them, especially in the general character of their organization; and yet in other respects, for example in the gradation of studies and the degrees conferred, they more nearly resemble the schools of France and Italy.

The instruction is mainly given by lectures, but examinations are more frequent, and exercises similar to the moot-court exercises at the law schools in America are more common; and, instead of one degree, as in Germany, there are three, corresponding almost exactly with those of France and Belgium. Thus, after two years' study, the successful student acquires the title of candidate; after three years, the degree of licentiate is conferred; and after four years, the degree of doctor. None of these are possible without general attainments corresponding in extent to those prescribed for other countries; nor without undergoing several successive examinations, both written and oral.

Two of the Scandinavian schools are Danish, located at Copenhagen and Kiel; one is Norwegian, located at Christiania; and two are Swedish, having connection with the royal universities at Lund and Upsala.

The *Rets- og Statsvidenskablige-Facultet* of the Copenhagen University has seven full professors and two extraordinaries, giving instruction to about 200 students; the faculty of the University at Kiel, five professors, and 60 students. Price of tuition is \$2 50 to \$5 50 per course per semester.

The faculty of law of the University at Christiania is similarly organized and is usually attended by over 100 students.

The *Juridiska Faculteten* of the Swedish University, at Lund, includes a professor of administrative law and national economy; a professor of the history of law; a professor of statute law and legal process; and a professor of civil law, Roman law, encyclopedical jurisprudence; and an adjunct professor of administrative and criminal law. The number of students in attendance is usually 120 to 150.

The faculty of the University at Upsala has a corps of seven full professors, and is attended by an average of 250 students. In both these faculties the public lectures are free to all matriculants. The private courses of professors and of *docents* require a fee of $1 50 to $3 per semester.

The Russian law schools are also faculties or departments of the universities, being found in those located at St. Petersburg, Moscow, Kiev, Kharkov, Kasan, and Helsingfors. In matters of organization, they bear a strong resemblance, as before intimated, to the German schools, though the courses are more definitely fixed, owing to the less number of extraordinary professors and *Privat-docenten* included in their corps of instruction. The number of professors proper ranges between four and fifteen; the number of students, between seventy-five and three hundred.

GREAT BRITAIN.

Anglo-Saxon schools of law constitute no exception to the general rule of educational inferiority that applies to this most energetic, practical and materially and politically progressive of all the races. It is true that they are not so far behind and inferior to corresponding schools of the Latin and Germanic races as are many other classes of the schools I have had occasion to notice; but they are, nevertheless, far inferior to what they ought to be.

In Great Britain there are nominal or real law departments in most of the universities, but they are generally very loosely organized and but imperfectly fulfill the office for which they claim to exist. Indeed, I know of no single, thoroughly organized, vigorous, and liberally officered university law school in the United Kingdom; such a school, I mean, as even the most partial friend of British institutions could for a moment, if intelligent, think of comparing with the faculties at Paris, Bologna, Vienna, and Berlin. This may be said of them, however, and more than can be said of our own, namely, that they only confer degrees upon such as have acquired, either prior to or during the period of their law study, a general knowledge of language, literature, and philosophy.

Quite a proportion of the London and provincial practitioners acquire their knowledge of law, and their authority to practice, under the auspices of those anomalous organizations known as the Inns of Court, whose chief virtue is that they keep the student in the atmosphere of the courts long enough, before admission, for him to acquire some knowledge of both principles and practice by absorption. They are, in fact,

mere societies of practitioners and students, possessing, by favor of ancient sovereign grants, extensive buildings, including libraries, public halls and lodgings, living under certain regulations as binding by reason of antiquity as if they were acts of parliament; but yet, in the main, yielding to each member the general prerogative of doing about as he pleases. The fees for admission to these inns of London, of which there have long been four—Inner Temple, Middle Temple, Gray's Inn, and Lincoln's Inn—are £30 to £40; beside which the admitted student must give a bond of £100 for the payment of the price of his meals during the period of his study. No person in trade of any sort, no deacon, and no one who has held the position of conveyancer's clerk can be admitted a member on any account; nor can solicitors and attorneys be admitted until their names have been two years off the rolls. The term of study before any student, unless a bachelor of laws or master of arts of the University of Oxford, Cambridge, or Dublin, may apply to the officers of the inn of which he is a member is five years; at the expiration of which period, if known to have been reasonably diligent and to have conducted himself in a manner becoming the profession, he pays his admission fee of £66 or more, according to the inn to which he belongs, takes the oath, and is recorded a barrister.

UNITED STATES.

In at least one respect the law schools of the United States are superior to those of England, namely: in that what they really assume to do at all they do more thoroughly and well. But it is no less true that they undertake very little in comparison with what is both attempted and accomplished in many of the other countries to which I have referred. In the form of departments, there are schools of law connected with Harvard College, Yale College, the State Universities of Michigan, Wisconsin, Kentucky, Mississippi, and Virginia; Columbia College, Washington University at St. Louis, and possibly with one or two others. Beside these, there is the independent school at Albany. In all these schools of law the term of study is two years, the courses of instruction being so arranged that a complete view is given during each year of the subjects embraced within it. The professors number from one to five in each of the schools; a majority of them, in many instances, being judges of the supreme courts and resident lawyers in regular practice, whose services are either entirely gratuitous or are given for partial compensation. In these cases there is usually one professor whose duty it is to perform the offices of dean, and whose more constant attention to the general interests of the department, and more frequent lectures on essential and practical subjects constitute him the working member of the faculty.

In most, if not all, of the schools named, there are systematic regulations as to pleading, moot courts, clubs for the reading of dissertations and the arguing of cases, &c., that contribute very greatly to their spirit and success.

In some of the schools—Cambridge Law School for example—a more limited course is provided for the benefit of the mercantile profession; embracing merely the leading branches of commercial jurisprudence, such as the law of agency, of partnership, of bailments, of bills of exchange and promissory notes, of insurance, of shipping, and of navigation and other maritime concerns. In some also—as in the department of law of Columbia College—there is provided a post-graduate course for those who desire to pursue their studies beyond the two years required for the diploma.

The only degree conferred by any of the American schools is that of bachelor, (LL. B.,) which comes as a matter of course at the end of the two years' study in the case of all students of ordinary capacity and diligence. But this degree not being an award of the government, as is the case in those European countries where the schools are government institutions, and the graduate an officer of the government the moment he receives the diploma, does not of itself confer the right to enter the courts as a practitioner, though it practically amounts to that, since the formal examinations by committees of court appointment are, in such cases, a mere form and nothing else.

The terms of admission to the law schools of the United States are as simple as any young man in the world could ask; namely, fair morals and the age of eighteen (at Cambridge nineteen) years. No educational foundation and no professional reading is a prerequisite. Though as ignorant of the world and as intellectually undisciplined as a Patagonian, if of the required age, he is admitted to the courses without hesitation, on making advance payment of the matriculation and tuition fees, which range between *nil* and $100 per annum.

The number of students in annual attendance upon these several schools varies from ten for some of the newly-organized departments in the far West to five hundred and over; the largest number being found in the University of Michigan, and the total number in all being about 1,200.

If, at the conclusion of this brief account of legal education in our own country, I were to assume to indicate its prominent deficiencies, I should point to the qualifications for admission demanded by the schools, the limitation in number of courses and degrees to one, and the inadequacy of the courses actually given to meet the demands of the profession.

I am familiar with the reasons urged by those who establish such conditions, or rather provide that no conditions shall exist; namely, the newness of our rapidly growing country, and the steady demand for lawyers in all parts of it, and the probability that, if admission to the schools were made more difficult, a still larger proportion than now would take the short cut to the courts by way of licenses easily acquired in any portion, and especially in the newer sections of the country, after a very little reading and some show of knowledge of the elementary

branches of law. But I am none the less certain that one of the very best ways to make the law school more eagerly sought by the better class of young men, as a door of entrance to the profession, is to make admission to it a test and evidence of general fitness for the profession. Besides, it is hardly a question whether it is the privilege of the educational representatives of a great profession that ought to be in reality, as it is nominally, a *learned* one, to degrade it by publicly and falsely admitting that the discipline of mind and the knowledge gained by a study of language, mathematics, the physical and natural sciences, history, metaphysics, and moral philosophy, are not essential to a full mastery of the principles of that profession whose complex and difficult office it is to deal with those subtile and intangible forces that govern the individual man, and control in the organization of government and in the development of human society. The mere collector of dues, the incumbent of notarial office, and the conveyancer may discharge their various duties on the simple basis of common sense, rudimental school education and knowledge of statutory law; but the *lawyer* will more nearly approach a complete fitness for the comprehensive field of duty upon which he is supposed to enter when he crosses the threshold of the superior courts, just in proportion as he approaches more nearly to a perfect use of his own powers and a mastery of all law, material, metaphysical, and social, as well as statutory, constitutional, and international.

These general remarks apply with no less force to the narrow limitation of their courses of study by which our law schools are characterized, than to the conditions of admission. In the older countries of Europe, where the study is rendered more complicated and difficult by the prominence and importance of the canon law, with which we have but little to do, as well as by the entanglements and conflict of laws, ancient, feudal, and modern, and the weight of numberless precedents, some reasons exist why the term of study should be longer than in this country, where the domain of written law is proportionally larger, and the intricacies of the practical department of the study proportionally less; but the difference in circumstances is not so great as the difference in requirements as to both preliminary and professional study. Moreover, the usual course of study, as laid down in the programmes issued by our schools, is itself convincing evidence of the validity of the criticism here made. They are eminently practical, and perhaps quite faultless in their adaptation to a certain limited department of the profession. But I must insist that the foundation they lay is not broad and deep enough for the professional career of the American lawyer.

In no other country is law, as law, and as a profession, so highly honored as in America. But the honor bestowed upon the profession is vastly more due to the reverence among our people for the law itself, and a certain glimmering conception in the public mind of what the profession ought to be, as the acknowledged highway to preferment and the

opportunities of statesmanship, than to anything it really is. In a word, our law schools and the profession of law in this country are the nurseries of politicians. I would make them nurseries of statesmen; and I would begin by demanding a suitable preparation for admission to the professional school, and by making the history of law and the principles of law—themselves acting on the deep foundations of natural, intellectual, moral, and social science—the very groundwork of professional study, and a fair knowledge of them a *sine qua non* of the highest honors conferred; and then, if necessary to this end, to procure the amendment of the conditions on which licenses are granted by the courts—that should be the next step taken.

Granting, as was conceded in the chapter on medical education, that a little science is better than no science, and that it is well to avoid making the conditions so difficult that none will enter the schools at all, what valid reason can be urged against establishing at once a higher and more protracted course of study, with a higher grade of honors, for those whose ambition is to become lawyers in the best sense? Would not the establishment of such higher course, especially if the instructional force should be competent and the terms reasonable, tend to draw into it many of the best and ablest who now attend upon the partial courses offered them, and at the same time exert an elevating influence upon all students of law, of whatever grade, and upon the whole body of the profession?

It seems to me that this is a matter of much moment. Our lawyers are also, in the main, our law-makers, our administrative officers, and the directors of our State and national affairs. How few of them have been students of political economy, of civil polity, and of the history of our own and other nations, is painfully manifest from the legislative discussions they hold and the laws they enact.

III.—SCHOOLS OF THEOLOGY.

The first Christian school of theology of which we have historic account was, in several important respects, a remarkable and most excellent model for all that should come after it. It was founded about the year 180, at Alexandria, by the learned and zealous Pantænus, a convert from the philosophy of the Stoics, among whom he was eminent. Its aim was to give the student a broad and generous preparation for his sacred mission by securing to him the best encyclopedic culture of the age, on the theory that he whose work it was to be to lead men to a knowledge of God and into relations of harmony with Him, should himself first have the most complete possible knowledge of both God and man; of God, by a study of His attributes as manifested in all His works, no less than by the communications of His Spirit with the individual human soul; of man, by a study of his nature, physical and spiritual, and of all the circumstances, both material and social, in the midst of which he is placed. The pupils of this school were accordingly taught not only the

doctrines of the church, the history of the church, and the peculiar offices of the ministry, but likewise the Hebrew language, mathematics, physical and political geography, natural philosophy, astronomy, logic, rhetoric, metaphysics, and ethics. It was in this school that Origen studied and afterward taught. Being in fact a school of general culture, with a theological department, it attracted to its courses many pagans, and became a center of great influence. It continued until near the middle of the fourth century, from which time forward, until the dawn of the Renaissance, theology appears to have been taught solely in private by the learned and zealous clergy of the times, and in monasteries, which for many centuries were almost the only guardians, as the clergy were the chief promoters, of learning. One of the monasteries of this period had a school—the school of St. Médard at Soissons—in which there were, in the sixth century, no less than four hundred monk pupils. Indeed, it may be assumed that during this long period, from the decline of the Alexandrian school to the beginning of the ninth century, about all the schools in existence were theological, for, with rare exceptions, there were no schools but those of the monasteries, and they were designed for the exclusive training of youth for the service of the church. In A. D. 816, however, the council of Aix-la-Chapelle determined upon the opening of a lay department in some of the hitherto exclusive schools, from which time forward, for a considerable period, the school of the monastery was here and there dual, consisting of the *schola interna*, for youth in training for the church, and *schola externa*, for boys not in such training. Nevertheless, the theological spirit and the theological department were still dominant.

At length, late in the eleventh century, came the new theological era, introduced by that brilliant succession of scholastic theologians, William de Champeaux, Pierre Abelard, and Peter Lombard, who were the first to make public applications of the dialectic methods of philosophy to questions of theology, and whose remarkable lectures in private schools of divinity and in the University of Paris drew thousands of the young men of genius and ambition from all portions of Europe, and made the divinity schools of the French capital, educationally, the theological center of the world.

Theology was also taught during this period, and throughout the twelfth century and the first half of the thirteenth, from individual chairs in Italy and England, and in 1257 was formally opened the faculty of theology of the University of Paris under the charter given by Philip Augustus fifty-six years before. Of course the multiplication of chairs only increased the influence of divinity teaching in the university and swelled the tide already so great, and accordingly during the next hundred years Paris was literally thronged with theological students, gathered from all the nations. So strong was the desire, so keen the appetite for the discussion of divinity and philosophic questions together, that the study of the Roman and French law was carefully and

persistently kept out of this greatest of the universities of that particular period until a much later day, from the fear of encroachments it might make upon the then supreme influence of the theological department.

The example of the Paris University in creating a faculty of theology as one of its departments was followed in succession by the various universities that sprang up in many European countries, so that very soon such schools were found not only in France, Italy, and England, the first to establish them, but also in Austria and all the other Germanic states, in the Netherlands, and even in Scandinavia.

The number of university faculties of theology in the European countries, and the total number of full professors in the faculties of each, are, at present, as follows:

Number of faculties and professors of theology in Europe.

Countries and states.	Faculties.	Professors.	Countries and states.	Faculties.	Professors.
France	7	42	Electoral Hesse	1	9
Spain	6	......	Mecklenburg-Schwerin	1	4
Italy	8	64	Netherlands	3	14
Prussia	8	106	Belgium	3	......
Austria	4	42	Denmark	1	5
Bavaria	3	25	Norway	1	5
Saxony	1	14	Sweden	2	8
Baden	2	14	Finland	1	4
Wurtemberg	2	13	Russia	1	7
Hesse-Darmstadt	1	6	Great Britain	8	34
Saxe-Weimar	1	7			

The theology of these faculties, at first and even down to the days of the reformation quite the same in all, after that grand upheaval naturally became so widely different as to demand separate faculties for the leading systems of theology. The divisions were not numberless, however, as in this country, for there were but two ecclesiastical divisions in Europe that had any influence in the direction or control of civil affairs, and hence could have any voice in forming those faculties—the Catholic and the Protestant. Every faculty of theology was the representative of one or the other of those two branches of the Christian church, and this is also true of all the continental faculties at this hour. In Italy, Austria, Bavaria, Russia, Belgium, Spain, and Portugal, they are exclusively Catholic; in the North German states, in Switzerland, Netherlands, and Scandinavia, they are exclusively Protestant; in France and Baden they are divided—there being one of each class in Baden, and five Catholic to two Protestant in France, while the Wurtemberg University at Tübingen presents the anomalous feature of having within it both a Catholic and a Protestant faculty. In Great Britain we find that beginning of divisions of the Protestant church

which, in its yet freer, I may say perfectly free, course, has resulted in so great a number of different kinds of theological schools.

But the prevalence of neither one of these two great branches of the Christian church has insured to the dominant branch a satisfactory representation of its doctrines during the past three centuries; for while the authority of the state church has usually held the teacher in the theological faculties to a faithful representation of its doctrines, yet even before the reformation, as already intimated, the philosophy of Abelard and his compeers had opened the way to serious disturbances of the dogmatic theology, so that the original independent schools and seminaries of the church were not only continued, but also strengthened and multiplied as a necessary safeguard against the growing tendencies to heresy in those maintained by the state. And when, again, in 1517, the fearless and irrepressible Luther startled and electrified the Christian world by the strokes of his hammer nailing his ninety-five theses to the doors of the *Schlosskirche* at Wittenberg, and boldly maintaining the rights of conscience, of private judgment, and of freedom of discussion, thus by another great example demonstrating the danger of a reliance on the university faculties for religious instruction, still more extraordinary efforts were made by the Catholic church to increase the proportion and influence of its own divinity schools. So strong was this feeling that the councils of the church took vigorous measures to insure the desired object by the institution of seminaries for the training of young men for holy orders without their being exposed to the corrupting influence of the universities. In some countries these seminaries were established in every diocese, and in Italy they even exceeded the extraordinary number of these. Each of them was under the exclusive control of the bishop of the diocese, the rector or governor being appointed by him, and their income supplemented, when necessary, by subsidies from his revenues. At first strictly confined to clerical instruction, they were afterward induced, by the offer of rich endowments and lay and municipal aid on such conditions, to open their doors for the instruction of lay pupils in various localities where separate lay instruction could not otherwise be so easily maintained. In some cases the government, being either partial to the church or desiring to make sure of its support, even placed portions of the state domain at their disposal, and diverted various lay and municipal foundations for their use. In these various ways the property of the diocesan schools increased, until in some cases they became very wealthy. In Italy, alone, the number of these seminaries exceeds the number of episcopates by twenty-nine, the total being no less than two hundred and sixty.

After the reformation had become an accomplished fact, influences of a similar character operated in the German states to produce an increased number of church schools in one or the other of the conflicting interests; and so elsewhere in like manner, until at last, under the lead of the Calvins, and Knoxes, and, later still, of the doubly-heretical

Spinoza, Kant, Jacobi, Fichte, Schelling, and Schleiermacher, Protestantism, scarcely less intolerant of new views and interpretations, was seen to look upon the faculties with suspicion and to follow to some extent the example of the mother church in fortifying itself, by means of schools solely under its own control, against the rationalistic subverters of its religious faith. Nevertheless, the Protestantism of continental Europe possesses a unity and solidarity nowhere else found in that great branch of the general church, and only surpassed by that of Catholicism.

In England the case is far different as to the multiplication of sects, though not so different, after all, as to the non-multiplication of independent church schools of theology. The Church of England divinity schools have been so intensely such, and nothing else, that schools independent of the university faculties have not been necessary.

In America, where we have no connection between church and state, and no state schools, there can be no theological faculties in the State universities, and each denomination is left to look out for its own theological interests by the establishment of such schools as it may seem to require. The present number in the United States exceeds ninety; the distribution of them among the leading denominations, together with the number of professors and pupils in all the schools of each, being very nearly as follows:

Number of schools of theology in the United States.

Denominations.	Schools.	Professors.	Students.	Denominations.	Schools.	Professors.	Students.
Catholic	21	124	829	Protestant Episcopal	4	21	271
Presbyterian	17	62	917	Methodist Episcopal	4	14	328
Baptist	13	31	236	German Reformed	3	9	108
Congregational	7	26	282	Unitarian	2	10	40
Lutheran	7	22	213	Universalist	2	4	......

Taken as a class, schools of theology are far more numerous than those of any other profession, with an average number of professors and pupils much less.

In the matter of the subjects taught, and the extent of the qualifications demanded for admission, though there is considerable diversity among the nations, there seems to be a nearer accordance and harmony of opinion than is observed in either medicine or law. The requirement as to admission is everywhere in Europe pretty nearly the same, the educational qualifications being, in general terms, represented by the degree of A. B., or the certificate of maturity from the gymnasium. In the United States, the qualifications demanded, though somewhat more various, amount to pretty nearly the same. Thus, at Cambridge Divinity School, candidates for admission must be either graduates in the arts,

or possess the ability to pass a preliminary examination in the following books and branches: Latin grammar, Virgil, Cicero's Select Orations and Sallust, Greek grammar, Zenophon's Anabasis, the first book of Herodotus, or the first two books of Zenophon's Memorabilia, geography, arithmetic, geometry and algebra, logic, rhetoric, Locke's Essay on the Human Understanding, (Book III,) intellectual and moral philosophy, and Butler's Analogy.

The courses of instruction all necessarily embrace the four great departments of theological study, namely, ecclesiastical history, exegesis, systematic theology, and practical theology, but the extent to which these general subjects are divided up among different professors, as well as the extent to which auxiliary branches and correlative subjects are taught, and the term of study are, of course, as variable as the means and the educational and professional views of those who have established and those who conduct them.

In France, where theology no longer enjoys its early pre-eminence, but is at present a third-rate profession, the number of its chairs in none of the faculties exceeds seven, not even in the great Academy at Paris, whose faculty of medicine has over thirty, whose faculties of law, of the sciences, and of letters have more than twenty each, while in all, except the one at Paris, the number is only five or six. The five chairs regarded as essential are those of dogmatic theology, Christian morals (*morale évangelique*,) ecclesiastical history and discipline, pulpit eloquence, (*éloquence sacrée*,) and Holy Scriptures. The sixth chair, when added, is for the teaching of ecclesiastical law, and the seventh is the chair of the Hebrew language. The term of study is three years.

The Italian schools average eight full professors, with departments varying somewhat in the several faculties, but—taking the faculty of the Royal University of Turin as an example—being substantially as follows: Moral theology, speculative theology, Holy Scriptures and Hebrew language, scholastico-dogmatic theology and sacramental material, biblical institutes, theological institutes, ecclesiastical history, and sacred eloquence. These studies occupy five years, biblical and theological institutes occupying the first year; moral and speculative theology, and sacramental material, occupying the second and third; and moral theology, speculative theology, sacramental material, and the Sacred Scriptures, the fourth and fifth years.

In the German states generally, the term of study is less—in Austria, four; and in Prussia and most of the other states, three years—and the courses take a wider range. The number of full professors is often ten or twelve, besides which there are sometimes as many as twenty-five extraordinary professors and *Privat-docenten*, who deliver courses of lectures on such subjects as they may select. Where the four years' course is given, as in the Austrian faculties, the distribution of subjects is about as follows:

First year. Fundamental theology, or general dogmatics, and the

rational ground principles (*Grundlage*) of the whole of positive theology, together with the study of the Old Testament; history of revelation, and introductory lessons on the general study of the Bible; exegetical lectures; and Hebrew language. The number of lectures, weekly, during this year is sixteen.

Second year. Special dogmatics, and study of the New Testament, with appropriate philosophical criticism; the number of obligatory discourses and lessons being eighteen, weekly.

Third year. Moral theology; dogmatics; history of the church, with a historical study of the dogmatical unfolding of ecclesiastical systems. Number of weekly lectures, eighteen.

Fourth year. Canonical law; practical principles, or pastoral theology; conclusion of theological encyclopedia.

The number of weekly exercises, it will be observed, is not so great but that a majority of students, pretty well disciplined as they must be before entering the theological school, may find time to attend to branches of study not included in the obligatory course. Accordingly very many of them devote several hours weekly to the study of foreign languages, for which they are likely to have special use, to the brilliant and profound lectures given by the *Privat-docenten* and extraordinary professors on biblical exegesis, speculative theology, church history, canonical law, &c. Some idea of the range taken by these non-obligatory exercises may be gained by a reference to the subjects announced by the *professores extraordinarii* and *Privat-docenten* of the University of Berlin for the winter semester of 1867; a translation of which programme will be found in the succeeding chapter on universities.

In the Scandinavian countries, in Finland, Russia proper, Great Britain, and the United States, the average number of professors, scope of studies, and duration of courses are very nearly the same, and hence do not require separate consideration. The course of study is three and four years, the longer being common in Scandinavia and the shorter in Great Britain and the United States, and the number of professors averages about four. The course of study, with so small a corps of professors, can hardly do more than begin the essential groundwork of a theological education, which, among the leading schools of this country, is understood to embrace the Hebrew language; the principles of criticism and interpretation as applied to the Bible; natural religion, and the evidences of revealed religion; systematic theology, Christian ethics, and practical theology; church history, church polity, and pulpit eloquence.

The cost of a theological education is least in Italy and greatest in England and the United States.

The degrees conferred in European countries are those of bachelor in theology, licentiate in theology, and doctor in theology. In Great Britain theological degrees are sometimes honorarily conferred, and often, when not thus conferred, are given with but little regard to the real claim the applicant may have by reason of a mastery of the

studies a knowledge of which the titles are supposed to imply. On the continent honorary titles are very rarely if ever conferred, and never after a course of study unless a pretty severe test has been made of the attainments of the candidate by both written and oral examinations. Consequently, in France, Germany, and other European countries, the title of doctor implies with much certainty that the bearer is at the same time a general scholar and a learned theologian. In the United States it means but little more than that he who wears it, though often sadly wanting in any sort of culture, in the best sense, is popular with his denomination or has a partial friend in some college board.

All in all, the schools of divinity throughout the world are, theologically speaking, in as good a condition as any other class of professional schools. And yet, even in this regard, everywhere outside of Italy too little time is given to the systematic study of divinity; everywhere outside of Germany they are so numerous and hence so weak in their instructional force as of necessity to do their work inadequately; and everywhere, excepting no country, too little scope is given to the courses of study. Religiously considered, the schools are almost universally too narrow and cramped in their ideas of the office of the church in the world, and hence themselves fall far short of fulfilling their true mission. There is much freedom of thought in some of them—in those of Germany more than in any of the rest—but it is too exclusively the freedom of speculative and rationalistic philosophy, a philosophy that takes loose rein, but runs mainly in one single direction, a sort of tangential freedom that is even in danger of passing beyond its true orbit; whereas the freedom of the theological schools should follow the order of the celestial systems, sweeping in vast orbits through the universe of truth, but, in their sublime courses, unceasingly held obedient to their eternal source and center.

Originally, the priest was, to the people of his ministration, at once the embodiment of the wisdom of the world and the gracious representative of the law of God. Such should he be to-day. The offices of religion are not the most sacred simply because they are so directly from God, who is equal authority for every good work; they are so directly from God, who is equal authority for every good work; they are, also, sacred because their fulfillment involves the most precious and most enduring, nay, *all* the interests of man. There is no knowledge, therefore, whether of things material or spiritual, temporal or eternal, that bears in any degree, as all knowledge must, upon the spiritual welfare of man, which the profession of the Christian ministry should not, as far as possible, attain. As the subject with which the schools of theology deal is infinite, so is the field of study they assume to open without other real boundary than the limit of human capacities and powers.

It is not assumed that the vast amount of knowledge and that high culture of all the powers herein implied are attainable by even the most

gifted within any reasonable period of pupilage in the schools, for these are the task of life; but the groundwork of such attainments should there be deeply and broadly laid by that profound, devout, and comprehensive study of the attributes of God and of the nature and relationship of man which alone are able to develop the spirit of a true and acceptable worship, or lead to a just appreciation of the priestly office and of priestly duty. If the schools could comprehend this and would hold themselves, with singleness of purpose, to such an ideal, our ecclesiastic teachers would soon be found approaching more nearly in their spirit and influence to the Great Teacher himself; the lines of religious sectarianism would be less and less narrowly and intensely drawn; and the church, at last brought into complete harmony with its Divine Head, would then have more fully begun the fulfillment of its mission among men.

CHAPTER XI.

NORMAL SCHOOLS.

General retrospect—Enumeration of normal schools in all countries—Schools of Prussia and other German states and of Switzerland—Schools in Saxony—French schools, primary, secondary, special, and superior—The minister of public instruction on Italian normal schools—Other continental schools—English normal schools—Normal school instruction in America—Normal University of Illinois.

With the progress that is now making in the establishment and perfection of schools for the professional training of teachers, the generations next succeeding this present will hardly realize that, although medicine and law and theology had for centuries been recognized professions, and were hence provided with schools for the training of those who were to engage in them, it was not until after the further lapse of full thirteen hundred years that the thought occurred to any one, or at least found practical application or even public expression, that the business of teaching was of so delicate, difficult, and responsible a nature as, above all other professions, to require special institutions for the preparation of those who were to assume its duties. Even now it is difficult to realize that up to the beginning of the present century the importance of such institutions had found prominent and practical recognition nowhere among the most advanced nations outside of the Germanic states. The art of escape from bodily disease, from the entanglements of legal subtleties and complications, and from the torment reserved for the impenitent in the world to come, was of such palpable importance as to demand the establishment of schools for systematic instruction therein; but the idea that there were any particular ways better than others to educate all the faculties of the child, bodily, intellectual, moral, and religious, so as to insure to each human being the earliest and most complete use of all his powers, this advanced idea seems not yet to have had place in any country of the world. And so, for generations, the work of popular instruction was left to the management of such persons as could find no other more honorable and remunerative employment.

At last, however, in 1681, the thought happily came to the Abbé de La Salle, canon of the cathedral of Rheims—a place distinguished for its learning as long ago as when, under Roman rule, it was the capital of Belgica Secunda—that being exceedingly difficult, and requiring not only much learning, but likewise a very thorough knowledge of human nature, as well as of the laws of individual development, the responsible work of training youth should not always be left to the incompetent bunglers who, as a rule, were then assigned to its performance. And being a practical philanthropist, he at once instituted a school for the

training of teachers in the principles of their profession; placing it afterward, in 1684, under the charge of that benevolent organization, the Brothers of the Christian Schools. This was the first normal school.

Again, in 1697, Augustus Herman Franke, a German philanthropist, formed, in connection with an orphan school he was conducting at Halle, in Prussia, a teachers' class, composed of pupils who assisted him at stated times, and twelve of whom, in 1704, he constituted what he called his *Seminarium Preceptorium*, or teachers' seminary. The twelve apt pupils thus selected, with their zealous teacher, constituted the first German normal school. After being trained for two years in the principles and practice of teaching, these pupils, together with numerous successors in the school, went forth as missionaries of the new gospel of education, until the leading minds of all the German states were at length aroused to the great importance of the work thus feebly begun.

In 1735 a seminary for teachers was established on a more liberal scale at Stettin, in the Prussian province of Pomerania; and in 1748 still another at Berlin, by Frederick the Great, who, by 1752, had become so deeply impressed with the importance of such institutions that, by a royal decree of that date, he provided that thenceforth all vacancies occurring in the schools established on the Crown lands should be filled by teachers selected from the pupils of this seminary. He also provided an annual stipend for twelve of the most worthy graduates to aid in their support until employed as teachers of the school. This institution, ably managed by Hecker, a former pupil of Franke, did a noble work in those early times of the normal-school movement, and by its success, as did also its predecessors, contributed to the successive establishment of others of the same class not only in Germany, but also, though later, in other countries, Austria following in 1767; Switzerland, in 1805; France, in 1808; Holland, in 1816; the United States, in 1839; England, in 1840; Belgium, in 1843; and subsequently all other enlightened nations, as will appear by the following statement of the countries, principalities, and subordinate states that have adopted them, together with the number of schools in each:

Prussia, including states recently absorbed, 62; Austria, 11; Baden, 4; Bavaria, 11; Wurtemberg, 7; Saxony, 10; Hesse-Cassel, 3; Hesse-Darmstadt, 2; Anhalt, 3; Saxe-Coburg-Gotha, 2; Saxe-Meiningen, 1; Saxe-Weimar, 2; Oldenburg, 2; Brunswick, 1; Luxembourg, 1; Lippe, 1; Mecklenburg-Schwerin, 1; Mecklenburg-Strelitz, 1; Lubec, 1; Frankfort, 1; Switzerland, 31; France, 141; Holland, 2; Denmark, 8; Sweden, 5; Russia, several, definite number not known; Italy, 53; Spain, several, exact number not known; Greece, 1; England and Wales, 23; Scotland, 2; Ireland, 1; Nova Scotia, 1; New Brunswick, 1; Canada East, 3; Canada West, 1; Maine, 2; Massachusetts, 4; Rhode Island, 1; Connecticut, 1; New York, with provision already made for four, 2; New Jersey, 1; Maryland, 1; Pennsylvania, with plans for twelve, 4; Michigan, 1; Indiana, nearly ready to open, 1; Illinois, 1; Wisconsin, with provision

made for six, 2; Iowa, 1; Minnesota, 1; Kansas, 1; Kentucky, 1; South Carolina, 1; California, 1.

The foregoing figures, for most countries, show merely that a beginning has been made in this noble enterprise of establishing schools for normal instruction. The zeal with which the work goes forward, however, is only equaled by that which characterizes the universal movement in the interest of industrial education.

PRUSSIA, SAXONY, SWITZERLAND.

In Prussia, Saxony, Switzerland, and probably in some of the other states, a further increase in numbers is hardly demanded by the interests of primary education, as the schools already established are quite competent to supply teachers for all the vacancies occurring in the schools of this grade; so that the wisdom, energies, and resources of the local, provincial, and state governments may be exclusively devoted to the improvement of such as at present exist. And noble progress are they making in this work. Even now scarcely anything seems wanting to the completeness of their system, and the practical wisdom, zeal, and thoroughness with which it is carried out.

THE GERMANIC STATES.

The German states, in general, seem to have based their action in establishing normal schools upon the following general principles:

1. The necessity to the growth of the state in wealth and power, and to the highest attainments in civilization, that education should be not only universal but of the best sort.

2. That this necessity of the state, re-enforced by the natural and no less sacred rights of the individual to the means of development, constitute a demand upon the government for the employment of all needful material resources, and the highest wisdom for the realization of this universal and best education of the whole people.

3. That such realization is clearly impossible without the agency of a great profession, concertedly, wisely, and zealously devoted to that special work.

4. That such a profession is only possible through the adoption of measures calculated to make it at once honorable, secure, and independent.

5. That while this condition of the teacher's profession is largely possible by means of generous and direct legislation, as, *e. g.*, by making the teacher a government officer, and, as such, securing to him a reasonable degree of independence of the whims and caprices of the people he may serve; granting him virtual exemption from the military service; insuring to him a fair compensation during the period of active service, and a moderate pension when no longer able to teach—measures for the early adoption and faithful execution of which the German states, as before remarked under the head of primary education, are entitled to

the first and highest honor—and by making the legislative requirement that all persons admitted to the profession should first be rigidly measured by a judicious standard of qualifications, it was nevertheless utterly impossible that such necessary condition of the profession should be fully realized without the co-operative agency of professional schools for the thorough training of all who were to be the instructors of the youth of the country.

Influenced by such convictions, the intelligent governments of Germany began the establishment of their normal schools. Let us see, in the next place, by what particular principles they were governed in the execution of their general purposes.

As there were two general classes of schools—the lower primary schools of the rural districts, and the burgher and other higher schools of the villages and cities—there should be two classes of normal schools to supply them; and hence we find both "rural normal schools" and "normal seminaries" for such as are to be masters and teachers in the country, and in the higher primary schools, the principles of their organization being in no respect different.

Again, the questions of sex and of the church were involved. These they settled by liberal provision for the establishment of both male and female schools, and schools of both the Catholic and Protestant faith. The small number of female teachers employed—under the mistaken notion that women are not naturally so competent to this work as men—rendered the establishment of but few female schools necessary, and so we find, even yet, but a small number of them in operation. The religious question has been variously settled, according to circumstances. Where the proportion of either sect was small, there has been but one school established; the minority being provided with religious instruction in harmony with its own preference. Where the sects were pretty evenly divided, the more general course adopted has been to establish two schools. And in a few cases there are found schools which in their organization, including the staff of teachers, are both Catholic and Protestant.

The question of number and location of normal schools, in the estimation of the governments, appears to have two very natural considerations, to wit: economy of establishment and support on the one hand, and the educational interests of the people on the other. It was possible for the governments, with the co-operation of the localities to be directly benefited, and with large private benefactions—of which there have been many—to create and maintain as many as five, six, or seven in each of the provinces, so that each district should have at least one; and if the number were so few as to require the pupils to go quite beyond the influence of their home associations, it would have the twofold effect, first, of diminishing the value of the instruction given to each pupil, by rendering personal attention to the wants of each less possible; and, secondly, of diminishing their sympathy with and interest

in the class of people among whom they were destined to labor when prepared to enter the profession of teacher. The educational considerations prevailed, and many of the German states have normal schools, of superior character, in such number that the students who attend them are all within a day's journey of their homes, with which they keep up an uninterrupted association during the whole period of their study; and to which, after the hard labor and self-denying discipline of the school for a term of years, they are happy to return should fortune assign them to the scenes of their boyhood as the field of their professional labors.

The question of support was settled on the most liberal basis; the plan adopted comprehending not only the entire support of the schools themselves, with the best corps of teachers the country could furnish, but also the entire, or at least half, support of the students themselves while at school, and all necessary aid after graduation until they are practically established in their profession.

It will thus appear that the normal schools of Germany rest upon the same general basis with the military schools. The schools are state institutions; the officers and professors are officers of the state; and the pupils are cadets, preparing for the civil service.

Inquiring more particularly into the organization of the schools and the regulations which govern them, we shall not fail to be still further impressed with the unexampled liberality, carefulness, thoroughness, and jealousy for the sacred rights of education with which the minutiæ of the system has been devised.

Each normal school consists of the professional or normal school proper, and a primary model school or school of practice, which also serves the purpose of a primary school for the education of the children of that portion of the town or city where the seminary is located.

The number of pupils of the normal schools is usually limited by the different states to about seventy, all of whom are required to board in the institution, that their habits and daily lives may be subject to the direction of its officers and professors, the number of which is usually four or five.

The director of the school is intrusted with large powers as the administrative officer of the school, and at the same time gives instruction—generally in the principles of teaching—to the extent of several hours each week. Directors of Catholic schools are designated by the Catholic bishop of the district in which the school is located; if a Protestant school, by the Protestant clergy of the district; the approval of the minister of public instruction being in all cases necessary. The professors are chosen by the director, with a like approval.

The examinations for admission are open to all candidates, without regard to class, not under seventeen years of age, (in some states the minimum age is eighteen,) and as the number who can be received is limited, the examinations are really competitive, only the picked candidates gaining admission—a circumstance which greatly contributes to

the high character and constant improvement of the profession. They are conducted by the director and professors of the school, in the presence of the magistrates and religious ministers of the district.

Each competitor must establish:

1. By certificate from a religious minister, that his past life has been moral and blameless; also, that he has been baptized.

2. By certificate from a physican, that he enjoys entire freedom from any chronic disease or hereditary taint; that his constitution and health are sound; and that he has been vaccinated within two years.

3. By certificates from two or more teachers, personally acquainted with him, that he has been characterized by industrious and moral habits, and is possessed of intellectual abilities adequate to the high duties of the teacher's profession.

These important conditions being established, the several competitors are then carefully and rigidly examined in the following studies, which constitute the full course of instruction in the highest of the primary schools, namely: Biblical history, the history of Christianity, the catechism, reading, writing, arithmetic, grammar, geography, German history, natural history, elementary principles of physics, singing, and violin music. After the examination, selections are made from among those designated as competent to enter, beginning with those whose qualifications are best, and proceeding downward until a sufficient number have been taken to fill the vacancies in the school.

Before entering their names as pupils, however, each candidate desiring to enjoy the national bounty must sign an agreement, first, to remain for three years after leaving the school at the disposition of the government, and during such three years to take any situation as teacher which the authorities of the district where the school is located may choose to offer him; or, second, in case of failure to obey the direction of said authorities within such period, or in case of a decision on his part to abandon the profession, to refund to the institution the whole cost of his education therein.

The course of study provided differs but little in the several states. In all it is divisible into three essential parts—the religious, the intellectual, and the industrial.

The religious training is deemed of primary importance, since it is upon the teachers of the schools that the country must largely depend for the inculcation of those moral and religious principles which are the only sure foundation of private and public virtue. The government rightly assumes, as a cardinal truth, that no one can be fit to lead the children of the state through the critical period of pupilage in the schools who is not only pure in heart and reproachless in life, but whose aspirations for the elevation of those committed to his charge are capable of becoming to them an inspiration, leading them to a higher appreciation of the beautiful and the good, and prompting in them sentiments of worship toward the Fountain of all Truth. Whether this ideal is often

realized, it is not so easy to determine; but it is certainly more likely to be where definitely desired and aimed at, than where not recognized as an essential condition of the best results.

The branches of study embraced by this religious section of the German course of study are: Religion—by which is meant general religious instruction, including, of course, in the normal school, an illustration of the best mode of imparting it; explanation of the Scriptures; Scripture history; the catechism; religious exhortation. There is, doubtless, sometimes an undue admixture of sectarian teaching with the purely religious instruction that should alone be given; but I believe I only reiterate the statements made by all who have studied the character of the German schools, that a more moral, exemplary, and truly religious class of teachers cannot be found in any other part of the world.

The intellectual training embraces a thorough review of the branches studied in the primary school, with new and extended courses in them, and in the science and art of teaching. In the Saxon schools, whose term of study is four years instead of three, as before remarked, the normal course also includes Latin, natural philosophy, geometry, and geometrical drawing. But Latin, and even French and English, may also be studied in the Prussian schools; and it is by no means unusual to find common-school teachers who are quite familiar with all these languages, by reason of a laborious study of them while in the normal school.

It is, moreover, a peculiarity of the German normal schools that the professors are required to give instruction in a great variety of practical matters which it is intended shall be taught, in turn, by the pupils when they become teachers themselves; such, for example, as how to treat the more common accidents to which people are liable; how to distinguish poisonous and the more common medicinal herbs, &c.; so that, in case of necessity, the teacher of the school may stand to the children and the people of the neighborhood in the place of a physician.

Great attention—more than in any other country of the world—is given to instruction in music; the pupils being required not only to gain a very complete knowledge of vocal music, in its various branches of choral, quartette, and concert singing, but likewise to learn the use of the piano-forte and organ, in addition to the violin, which in the primary school may have been the only instrument used. This fine musical command the German teachers almost all acquire is of very great advantage to them throughout their whole professional career; not only being an unfailing source of enjoyment to themselves, but giving them, when skillfully used, an extraordinary power over their pupils.

The study of drawing, particularly of linear and geometrical, constitutes still another feature of the instruction in the German normal schools—to which so little attention is paid in those of our own country—and adds another element to the superior power of the German teacher, whose skill with the crayon has been to me a marvel and delight

as often as I have witnessed it. There is hardly a single branch of study in which it is not available with great effect.

The industrial department of the training given by the normal schools consists in various exercises in the garden, invariably connected with them, and in such general service about the establishment as in less laborious and practical institutions is usually performed by hired laborers and servants; the motive of the government in making these regulations being less the one of economy to the institutions, than to insure a harmonious development of all the powers of the pupil, to promote his bodily health, to keep him thoroughly and vigorously occupied, and the better to qualify him for those necessities for economy and self-denial likely to arise in after life.

During the last year of the course, much of the pupil's time, during either the forenoon or afternoon, as the necessities of the normal and the model school may require, is spent in the practice of the teacher's art, under the eye and direction of an experienced master, so that when the end of the whole period of study is reached he is ready to enter upon more independent duty.

Examinations are held during the course at the end of each year; and, should there be any pupil in the school whose abilities, industry, or general deportment indicate a lack of fitness for the profession, he is retired from the institution. But, after all, it not unfrequently happens that the pupil reaches the end of the third or fourth year's study without such qualifications as are deemed essential to a proper discharge of the duties of independent teacher; and so the government has placed another bar at the door of exit, in the form of a most rigid and relentless examination, with three grades of certificates, and authority to turn back any whose attainments do not entitle them to even the certificate of lowest grade.

These senior examinations occur every year, and in the Prussian and most other German schools embrace the following subjects: Biblical history; the history of Christianity; the catechism; reading, writing, and arithmetic; grammar; local and physical history; natural history, including geology, mineralogy, zoology, and botany; the physical sciences; pedagogy, with practical management of classes; drawing; singing and chanting; the organ, the piano-forte, and the violin. The examination is conducted in the presence of the educational magistrates and the clergy of the district, together with such other persons as choose to attend, and continues about two days.

SAXONY.

In Saxony the examination also includes, in addition to the foregoing, geometry, the theory of music, logic, and psychology, and continues three full days.

Such pupils as prove themselves thoroughly proficient in all the branches taught receive a diploma marked "1," which means excellent,

and entitles the possessor to enter at once upon the discharge of the duties of independent teacher in any of the primary schools of the country. Those who fall below this and yet display qualities and attainments that forbid their rejection, receive a diploma marked "2," and those who rank a little lower still, a diploma marked "3." Neither a second nor a third rate diploma entitles the holder to enter at once upon the discharge of the duties of principal teacher. He must first serve two or three years as an assistant to some master, if the holder of a second grade diploma, and then go back to the college and be examined again. Should he fail a second time, he must take another term of apprenticeship and study, and repeat the trial at a stated time, until he either enters the profession or is ruled unworthy to do so. The recipient of a third-grade diploma is obliged to return to the college at the end of the first year, and undergo another examination to test his improvement in those branches in which he was most deficient; and, in case he should give no evidence of application and progress, may be ruled out without further trial and deprived of the diploma already acquired.

And so at any time in the subsequent history of an approved and honored graduate, if he should seem to have grown a little rusty, or needs to be made better acquainted with the later and more approved methods of teaching, he may be required to return to the college and brush up for more efficient service; the government meantime continuing his salary for the benefit of his family, paying his traveling and other extra expenses, and furnishing a temporary substitute to take his place in the school during his absence.

But the normal school is also made a center and rallying point for all the teachers within the district to which it belongs, by periodical conferences held therein at annual or shorter intervals; on which occasions the professors, who make it a business to keep fully up with the times in all departments of the profession, present for consideration and discussion such new views and reported improvements as promise advantage.

With such schools and such state regulations governing the department of public instruction, it is hardly any longer a wonder that Germany and Switzerland—whose systems are nearly the same—enjoy the honor and blessing of the best primary school-teachers in the world.

FRANCE.

The French government, notwithstanding the pioneer movement of the Abbé de La Salle, and the later example set by Prussia and other continental states, did not fairly inaugurate the work of establishing normal schools until the Emperor Napoleon I began it by the creation of the *École Normale Supérieure* at Paris in 1808. After this, a long period elapsed, during which but little—comparatively—was done. But of late years there has been a more remarkable development of them

there than in any other conntry of Europe, the present nnmber being, as noticed in the preceding list, 141; of which 87 are for males and 54 for females. Jndging from the greater proportionate increase in the number of female as compared with male schools during the recent years, (the proportion since 1859 has been as 24 to 16,) it may be inferred that the government intends to add to the nnmber at present existing nntil there shall be at least one of each kind in each department of the empire.

Of the 141 schools all are primary except the superior school at Paris and a recently established secondary school for the training of teachers for the scientific course, created by imperial decree in 1865, as an essential part of all the *lycées.*

The distinctive features of the French schools are the following:

1. The age for the admission to the male schools is sixteen years; that for the female schools being seventeen.

2. The candidates are examined in the chief town of the department in which they reside by a commission named by the rector of the academy to whose ednicational jurisdiction the department belongs, and the admission of such as snceeed is annonnced by the minister.

3. The cities, the departments, and the state together provide a given number of bursaries, half bursaries, and three-quarter bnrsaries for pupils; besides which the school is allowed to receive pupils who pay for their board at prices varying from 300 francs to 420 francs, due in tenths at the end of each month until paid.

4. The bursaries are granted by the prefect of the department in conncil.

5. The recipients of the bnrsaries are known as pupil-masters (*élèves-maitres*) or pupil-mistresses, and, as a consideration for their education and exemption from military duty, are required, before admission, to enter into an agreement to serve the state in the capacity of communal teachers during the period of ten years from the date of graduation.

But the most interesting peculiarity of the French system of normal schools consists in the provision made for the instruction of teachers of secondary and snperior schools.

The *École Normale Supérieure,* located at Paris, is designed to form professors for the higher, secondary, and the superior schools in the department of public instruction. It belongs to the class of schools called *internal,* or boarding schools, and both instruction and boarding are gratuitons. The term of study is three years. The conrse of study embraces two sections, the section of letters and the section of sciences.

The law requires that the candidate shall be either a native Frenchmen or naturalized citizen, between the ages of eighteen and twenty-four years; that, if over twenty, he shall prodnce a certification of liberation from the military service, signed by the mayor of the commnne; that he shall be free from any bodily infirmity or taint of constitntion that would unfit him for the instructional service; that he shall enter into a legal

contract to serve the State ten years in the department of public instruction; and that he shall establish, by certificates from the officers of the school to which he has belonged, whether as pupil or teacher, that he possesses the requisite moral qualifications.

The examinations for admission consist of two series; the first bearing upon the general qualifications of candidates authorized to compete, and determining the admission or non-admission of each of them to the oral examinations; the other series are held among the candidates admitted to the oral tests, in order finally and definitely to determine their admission to the school.

The first examinations are held in the academies of the empire, where all inscriptions or enrollments of candidates are originally made. They are exclusively written and bear chiefly upon literary or scientific studies, according as the candidate proposes to enter the section of letters or that of the sciences. The compositions required at these first examinations are written on the same subject by all the candidates in different parts of the country, upon the same day and within the same space of time. Those bearing upon letters consist of—

1. A philosophic dissertation in French.
2. A Latin discourse.
3. A French discourse.
4. A Latin translation.
5. A Greek thesis.
6. A composition in Latin verse.
7. A historical composition.

The compositions required of candidates for a place in the scientific section are—

1. The philosophic dissertation and the Latin translation required for the section of letters.
2. The solution of one or more mathematical problems.
3. The solution of one or more problems in physical science.

Such candidates as successfully pass these ordeals then present themselves, at an appointed time, at Paris, for the purpose of undergoing the second series of examinations and fulfilling certain other conditions, of which the following are chief:

1. Each candidate must produce the diploma of bachelor in letters, or bachelor in the sciences, according as he designs to enter the literary or scientific section of the school.
2. He must produce a legal contract to refund the cost of his board in the institution in the event of a failure to complete the ten years of service pledged to the state as a condition of free education.
3. Candidates for the section of letter must prove, moreover, that they have devoted one full and distinct year to the study of philosophy.

The oral examinations for the section of letters consist in explanations and questions upon the texts of authors studied in the classes of rhetoric and philosophy; for the section of the sciences, in questions

upon subjects embraced in the special course of mathematics as taught in the *lycées*. Moreover, candidates for admission to the scientific section are required to execute a drawing illustrative of a question in descriptive geometry, and to copy a given sketch of the human head.

At the conclusion of these final examinations the minister of public instruction formally announces the names of the candidates admitted to the school.

The studies embraced in the three years' course of the *École Normale* are extensions, in kind, of the branches already gone over by the pupils in the attainment of their degrees of bachelor, together with such others, more or less collateral, as are calculated to give the student a mastery of the whole field embraced in the courses of such superior schools as he may be called to teach in or to preside over. Thus, in the scientific section, the first year's course embraces the differential and integral calculus in connection with the physical and natural sciences. The second year carries the student still further in all these general departments of study, nor yet omits those higher philosophic, literary, and art studies which are essential to well-rounded scholarship. In the third year there is a division of studies, with more direct reference to the bent of genius and the future plans of the several scientific students—some devoting themselves almost entirely to pure mathematics and astronomy, others to physics and mechanics, and still others to chemistry and the natural sciences.

Examinations of all pupils are held semi-annually, and advance is allowed only when the pupil is thought to be prepared for the range of study next higher. During the third year, and to some extent also in the second, the pupils are favored with opportunity for practice in the *lycées* of the city. At the end of the full term of study all who have reached that point are admitted to an examination for the title of *aggrégé de lycée*, or, in ordinary parlance, for aggregation—a condition and title that confer the privilege of teaching in the *lycées* of France. Such candidates as acquit themselves with distinction in these trials have the choice of being assigned at once to any vacancies there may be in the *lycées*, or of spending another year or two in following a more advanced course provided for those who aim at the highest posts of professional work in the academies and other superior schools. The less distinguished pupil is immediately nominated to a *lycée*, but only to the post of assistant professor, with the privilege of returning, after one year's service in that capacity, and again presenting himself for aggregation.

The professors in the *École Normale* are known by the title of *maitres de conferences*. The number of those in the section of letters is 12; in the section of the sciences, 11. The officers are, first, the director of the school; secondly, the administrator of the school and director of scientific studies; thirdly, the director of literary studies; and, fourthly, the steward. The number of students is 110; the number of annual vacancies about 35.

Some idea may be gained of the estimation in which this great school is held in France, and of the great desire there is to enter it, by the fact that, with this small number of vacancies, the competition for admission is often between from three hundred to over four hundred bachelors of letters and of science. This fact will also show how potent an agency this school is becoming for the invigoration and elevation of the normal profession in France, and for the improvement of all classes of schools.

The pride felt in the school by the government is manifested by the beautiful edifice erected for it in *Rue d'Ulm*, by the superior equipments with which the scientific departments are furnished, and by the annual appropriations of about $60,000 so cheerfully made for its support.

After all my journeyings in foreign lands, with special visits to hundreds of schools of nearly every class, I find in the gallery of memory no picture to which I now refer with more profound interest and satisfaction than to this of the *École Normale Supérieure* of Paris, as I so often saw it in the *Rue d'Ulm*, with its pleasantly environed buildings bearing aloft the flag of the empire, its twenty-three able, learned, and zealous professors, and its one hundred and more intellectual, cultivated, and ambitious young men, all jealous, not alone for their own interests and reputation, but likewise for the honor and glory of France, and resolute in a common purpose to help in the work of placing her educationally in the front rank of nations. Would that every country in the world had a similar institution for the reformation and advancement of its secondary and superior instruction, by the introduction of new and better methods, by the weeding out of incompetent and spiritually dead professors, and by the infusion of new life and energy into all its higher schools and colleges. I know of no country that needs such an institution more than ours.

But the establishment and development of this school of high rank did not fully satisfy the learned and earnest minister who stands so worthily at the head of the department of public instruction, and in whose judgment some more special provision was necessary for the development of that great system of courses and schools created in the interest of scientific and technical education, to which reference has so frequently been made in the pages of this report.

The *École Normale d'Enseignement Spécial* has, therefore, been established to meet this want. On the subject of its origin and plan of organization and development I am glad to be able to quote from the minister, M. Duruy himself, who, in a circular letter of information and exhortation to the rectors of academies, accompanying a new plan of studies for the special schools and bearing date April 6, 1867, uses the following language:

* * * "When the Emperor Napoleon I wished to give a higher character to classical studies he founded the Superior Normal School, out of which have come so many celebrated men, who still form the main strength of the university. When one of my illustrious predecessors

undertook, thirty-three years ago, to organize, at last, popular instruction, he created normal schools for the departments, which furnish the primary schools with their best teachers, and the country and the Emperor with the most devoted servants. If, for forty years, special instruction, which has been tried under diverse names, has not succeeded in definitively establishing itself, one of the reasons of its failure has been the want of a staff of teachers specially trained for this system of instruction. The foundation of a special normal school will supply this want; and the university will soon be able to provide the *lycœs*, the colleges, and the great communal schools with masters capable of seconding the industrial activity of the country by teaching all the applications of the sciences.

"This normal school, like the system of special instruction itself, will have a mixed character. Pupils will be secured for it by reason of scholarships founded by the state, the same as for the normal classical school; but there will also be departmental scholarships, as there are in the primary normal schools. Towns, as well as private individuals, have already founded such scholarships; and the school may also have independent boarders.

"The recipients of state scholarships will enter this school after a competitive examination, and the holders of departmental scholarships will enter after a competitive examination, or otherwise, on conditions that will be determined by the departmental authorities. The first-named will remain at the disposition of the state after the completion of their course of study and during the whole of their ten years' engagement. The others will be at the disposition of the departments and the communes that have provided the means for their education; but the functions and the needs in connection with this system are so varied that every pupil issuing from a special school will be sure to find good and remunerative employment for the knowledge he has there acquired.

"Some persons are of the opinion that this normal school should be established in Paris; but I think it will be better situated in the country. There will be as little want of good professors for this institution as there is for the seventy-two provincial lyceums; and at Cluny the pupils will find excellent opportunities for study, without being exposed to the dangerous seductions of a great city, where also they may run the risk of acquiring tastes at variance with the modest habits and the austere life of a teacher of youth.

"Three causes have hitherto hindered the development of the system of special instruction. There was a lack of teachers required for the purpose. This lack has been met by the establishment of the normal school. The salaries were wretched. The decree of the council of state allows their increase, and secures to the teachers in the special schools that outward dignity of position which is indispensable to the maintenance of the rank of the office. Lastly, the teachers were kept in an

inferior condition, and the resolution of which I am about to speak will cause this inferiority to disappear.

"In order to have good teachers, it is not enough to give them the instruction they will have to impart to others, and to secure to them, in return for their services, remuneration in accordance with that received by the functionaries connected with the other branches of public instruction; care must further be taken to honor their condition by elevating it in the eyes of others, and to open to their legitimate ambition access to the titles and honors which the university bestows upon proved merit. In accordance with this view, a special degree has been created, in order that this branch of instruction may also have its crown. * * *

"I trust, M. le recteur, that all these measures, taken together, will definitively establish a system of secondary instruction for the people. It is time that we should make speed. In the peaceful but redoubtable struggle in which the various industrial nations are engaged victory will not be to that one that can command the greatest number of hands, or the greatest amount of capital, but to the nation whose working classes are the most orderly, the most intelligent, and the best educated. Science continues its discoveries, and every day places at the disposal of industry new and serviceable agents; but, in order to be well applied, those agents—which are sometimes very delicate, and sometimes very powerful—require to be skillfully handled. This is the reason why, at the present day, industrial progress is so intimately connected with educational progress, and why questions which it is the duty of the university to examine and to solve have acquired so great importance, even as regards the material prosperity of France."

With an intelligence and comprehension of the wants of education and industry like this directing and governing the special instruction movement in France, we hazard nothing in predicting for it an early and glorious success.

To the reference above made to the national normal school for special secondary instruction I will only add that the general features of its organization and the mode of gaining admission are much like those of the superior normal school already described, except that the educational qualifications for entrance are not so high, and that the term of study is two years instead of three, with the privilege, however, of a third year accorded to pupils who design to qualify themselves for teaching in the higher special schools. The professorships are nineteen in number, to wit, of mathematics, of mechanics, of cosmography, of chemistry, of natural history, of French literature, of ordinary legislation, of industrial and rural economy, of history and geography, of the German and English languages, of physics, of grammar, of hygiene, of the science of accounts, of linear design and graphic works, of music, of gymnastics, of moral philosophy, and of pedagogy.

Connected with the school, and serving as a field for practice, there

is a special model college, with its own officers and with fourteen professors.

This first and only school of its kind has been in successful operation at Cluny for five years, the public interest in it growing from year to year. With its four classes of normal schools, namely, its school at Paris for the training of teachers for the *salles d'asile*, (infant schools,) its one hundred and thirty-nine primary normal schools, its normal school for secondary special instruction, and its superior normal school, all recently organized and crowded forward in their career of development by the enthusiastic spirit and energetic will of the distinguished minister of public instruction, sustained by the all-directing Emperor, it may be assumed that the French nation will, before many more years have passed, be able to present to the world a division of the grand army of teachers of which the most ambitious people might well be proud.

ITALY.

The Italian normal schools are organized upon a plan very much like those of France; the design having been to provide both a male and female primary school for each of the provinces. At present the number is equal to that of the provinces, and they are distributed in such manner as to make this limited number meet the wants of the several provinces as well as practicable. The government schools, which constitute a large proportion, are free as to instruction, and the whole support of a limited number of pupils is also furnished. The provincial and municipal governments likewise provide many free and partially free scholarships, as in France.

The minimum age for admission to the male schools is sixteen years, to the female schools fifteen.

The course of instruction embraces: 1. Religion and morals. 2. Pedagogy. 3. Italian language and rules of composition. 4. Geography and national history. 5. The principles of physical and natural science, and the elements of physiology and hygiene. 6. Calligraphy. 7. Arithmetic and elementary geometry. 8. Linear design. 9. Choral singing.

The general management of the schools is subject to a directing council, consisting of the inspector of primary schools, the syndicate of the commune, two persons elected triennially by the school council of the province, and the head of the school. Their immediate management is intrusted to a director for each, and an assistant or vice-director. The number of professors in all cases equals the number of branches of study above named, and not unfrequently there are others, charged with extra branches.

The female schools are also directed and chiefly taught by male officers and professors, with such assistance from one or two females as is necessary to the management of the boarding department, and instruction in needle-work and other like accomplishments peculiar to their sex.

The full period of study is three years, and satisfactory completion

entitles the pupil to the certificate of "master of superior grade;" but the course of study is so arranged that any pupil unable or not inclined to complete the entire course may, at the end of the second year, present himself for examination as a candidate for the diploma of "master of the second grade." This rule applies alike to the male and female schools.

Besides these fifty-two primary normal schools, Italy has again, after a suspension of sixteen years, a superior school in active operation at Pisa.

The *Reale Scuola Normale Superiore* is almost identical in its aims, and in the form of its organization, with the *École Normale* of Paris; being designed to educate professors and masters for the *lycei* and *scuole tecniche* of the kingdom, and being divided in like manner into two sections, viz.: 1. Letters and philosophy. 2. Physical and mathematical science. The term of study is three years. At present but twenty places are entirely gratuitous, admission to which is gained through competitive examinations.

Italy is greatly in need of a large number of efficient and thorough normal schools; and it is gratifying to know that those now in existence have already begun to feel the inspiration that has lately entered into the educational department of this long-dismembered and half-dead, but now united and living kingdom.

OTHER CONTINENTAL NORMAL SCHOOLS.

Of the other continental normal schools but little requires to be said. Those of Spain, lately established, resemble those of France and Italy, after which they were modeled. The schools of Belgium are essentially French. Those of Holland differ but little from those of the German States, except that, instead of having model schools attached to them, the pupil teachers are admitted to the public schools of the cities a certain number of hours each day for practice. I failed to find anything in Denmark that should be considered under this head. In Sweden the case is different. The first seminary for teachers was opened at Stockholm in 1861, with a principal and five teachers. Since then a female school, with a lady superintendent, three male and three female teachers, has been established there. The number of pupils attending both in 1867 was one hundred and thirty-five. Besides the usual teaching in such schools, the German, French, and English languages are added; model schools are attached. In 1866 a school was also opened at Skara, and since then a private school has been established at Gottenberg and Nordköping. In Russia but little has yet been done directly for this profession. All these northern countries, however, have imbibed much of the general European spirit of progress, and are steadily moving in the direction of improved and more liberally furnished normal instruction.

ENGLAND.

English normal schools have been spoken of, in another place, as dating their origin no further back than 1840. In doing so I was not oblivious of the fact that, as long ago as 1798, individual movement was made in that direction at London by Joseph Lancaster, the father of the monitorial system. But this movement was similar to those of the Abbé de La Salle, in France, and of Franke, in Prussia, a hundred years before, and can hardly be considered a beginning of the establishment of normal schools proper.

The real beginning was in 1839-'40, when James Phillips Kay, (now Sir James Kay Shuttleworth,) who had just completed a tour of observation of educational matters in Prussia, and who was that same year appointed first secretary of the newly-created Committee of Council on Education, undertook, together with Mr. Tufnel, the establishment of what is known as the Battersea Training School. This was also a private enterprise; the institution having been founded and put in operation at the expense of these two gentlemen, in the belief that its success would ultimately lead the government to undertake the work on a scale commensurate with the great wants of the kingdom. Their expectations as to the training school were fully realized; and although the government has not even yet taken hold of the subject after the thorough French and Prussian style, school after school has been established, with the aid government grants, and private, municipal, and society bounty, in various cities of England, Scotland, and Ireland. Many of the schools are of low grade, designed to furnish teachers for the industrial, ragged, and reformatory schools, while others are for the improvement of the ordinary primary school.

The history of many of these schools is full of interest; but as they have no important features different from those of the countries already considered, and as the normal schools of Great Britain are, as a class, still in a very loose and unsystematized condition, I do not feel warranted by the plan and necessary limits, in space, of this report, in according to them more than this mere mention.

UNITED STATES.

Normal-school instruction in America, though late in getting recognition and adoption as a necessary means of improving the quality of the common schools, has, in recent years, received much attention and a steady development. The question of the establishment of normal schools began as long ago as 1816; the honor of the first public advocacy of their importance belonging to Denison Olmsted, afterward for many years, and up to the time of his death, a distinguished professor in Yale College. But the movement then begun did not culminate in the actual establishment of such an institution until 1839, when, under the stimulus of a conditional offer of $10,000 by Mr. Edmund Dwight, of Massachusetts, legislative measures were taken by that State for the immedi-

ate opening of a normal school at Framingham. In pursuance of this action, the first normal school of America was opened at that place on the 3d of July, 1839. Soon afterward two others were established by this same State, whose present number is four. From that center the influence extended itself outward in every direction until now nearly every Northern, two of the Southern, and one of the Pacific States, together with Prince Edward Island, New Brunswick, Nova Scotia, and both East and West Canada, are supplied with at least one normal school each; while in several of those States and provinces, as will appear by the enumeration already made, the number is two, three, and four.

Nor is this all. The movement is a progressive one, every day awakening fresh enthusiasm and gaining new strength. It is an essential part of the scheme of universal education, and is bound to go on until every State of the Union is provided with well-endowed, ably-officered, and thoroughly-managed normal schools, sufficient in number to educate all the teachers required for their numerous public schools. Already several of the States have made liberal provision for the successive establishment of schools in such number, by appropriations of money to be made from time to time as the condition of the public finances shall warrant and the hearts of wealthy citizens may prompt; and others have consecrated the proceeds of various grants of land to this object.

New York, Pennsylvania, and Wisconsin—and doubtless others with whose movements I may be less familiar—are notable examples of this anticipatory action. In the State last named, for instance, the legislature has set apart a percentage of the proceeds of certain "swamp and overflowed lands," granted to the State by the general government as an endowment for such number of normal schools as it may be thought judicious to establish. Such proceeds already amount to $602,791 50, and the amount is annually increased by the further sale of lands; the expectation being that it will ultimately—after the disposal of the seven hundred thousand acres of lands yet unsold—equal a sum scarcely less than $1,500,000. Upon this magnificent basis the normal school board has projected a plan for the establishment of six distinct normal schools, so located as to meet the wants of all portions of the State. Two of this number have already been established and are in successful operation, and active measures are in progress for adding the others as fast as the increasing fund will warrant. The plan adopted for location has been, after determining that one shall be placed in each of the six congressional districts, to invite offers or propositions from such towns and cities as may desire to secure the proposed institution; and it is highly creditable to the enterprise and intelligence of the various communities embraced that the competition has, thus far, been sufficiently active to insure the most desirable sites, together with funds sufficient for the erection and furnishing of elegant buildings, independent of appropriations from the normal-school fund.

On the subject of organization and efficiency of management, I am glad to be able to speak of American normal schools in terms of high commendation—more especially glad for the reason that in the case of almost all other classes of schools the comparisons made have been necessarily unfavorable to this country. To say the very least of them, they constitute a noble beginning of a most important work. Without those stringent and compulsory regulations which characterize the public instruction of the most advanced European countries, the regulations that govern the admission and thorough qualification of pupils are necessarily less rigid and effective here than in such foreign states; but this is the fault of our too lax and inefficient laws, and not of the normal schools, which, for material equipment and ability and spirit of instructional force, are quite in advance of any other class of our schools, and deserving of honorable mention in comparison with those of the same class abroad.

In one important respect our normal schools are an improvement on the best of those in Europe—they recognize the peculiar genius and fitness of women for the work of the teacher, their equal claims upon the state for the opportunity to qualify themselves for the responsible duties of that sacred office, and the entire practicability, and even the advantage, of their co-education with candidates of the other sex in the same professional school.

The model school, as an appendage to the normal school proper, is here, as in foreign countries, an invariable rule.

The term of study is usually three years, though certificates of actual attendance and proficiency in studies pursued for a shorter period are also granted. Tuition is free, but pupils board—usually in private families of the town—at their own expense.

From among the twenty-seven schools of the United States, the Normal University of Illinois may be taken as an illustration of the class. This institution, located at Bloomington, has been in operation about six years. Its pecuniary basis is the university fund, it being the only department that has hitherto been established. The handsome grounds and magnificent buildings, which are among the finest school buildings in the country, are mainly the gift of the locality. The means of illustration, especially in the department of the natural history of Illinois, are good; the library affords facilities for the profitable study, during leisure moments, of branches of learning collateral to the professional course; and the gymnasium, for systematic physical exercise under a professional leader, together with the general régime of the school, affords a good guarantee of bodily health for the pupils, and their appreciation of gymnastics as a branch of study that should be introduced in all the schools of the country. The term of study is the usual one of three years. The course of instruction, with the total number of weeks devoted to each study during the whole period, embraces the following subjects: metaphysics, (15 weeks;) history and methods of education, (51

weeks;) Constitution of the United States, and of Illinois, (13 weeks;) school laws of Illinois, (12 weeks;) English language, (93 weeks;) arithmetic, (28 weeks;) algebra, (12 weeks;) geometry, (28 weeks;) natural philosophy, (15 weeks;) book-keeping, (12 weeks;) geography, (40 weeks;) history, (28 weeks;) astronomy, (13 weeks;) chemistry, (13 weeks;) botany, (12 weeks;) physiology, (15 weeks;) geology, (12 weeks;) vocal music, (120 weeks;) writing and drawing, (120 weeks.) There is also an optional course of study for those who wish to qualify themselves for the charge of the higher class of public schools, embracing, Latin language; (80 weeks;) algebra, (15 weeks;) higher mathematics, (25 weeks.)

These several subjects are taught by five professors, and a preceptress and instructress in grammar and drawing—the professorships being so arranged as to gather the studies into the following groups, to wit: mental science and didactics; geography and history; natural science; mathematics; language.

Candidates for admission to this school are required—

1. To be, if males, not less than seventeen, and if females, not less than sixteen, years of age.

2. To produce a certificate of good moral character, signed by some responsible person.

3. To sign a declaration of their intention to devote themselves to school-teaching in Illinois.

4. To pass a satisfactory examination, before the county school superintendents of the counties where they reside, in reading, spelling, writing, arithmetic, geography, and elements of English grammar.

The necessary expenses, exclusive of pocket-money, are estimated at from $97 to $188 per annum for each pupil. Text-books are furnished by the institution free of expense, the pupils being required to make good all damages done to them while in their possession.

The model school embraces four departments, corresponding to those which constitute a complete system of city graded schools, to wit, a primary department, an intermediate department, a grammar school, and a high school, the number of principals and assistant teachers employed being nine. The high-school department of this model school has a four years' course of study, embracing two sections or courses, general and classical, and is quite equal in the range of its studies to the academical course in most of our American colleges.

The total number of normal pupils annually in attendance upon this excellent institution is usually about three hundred; the number of model-school pupils, about five hundred.

It is easy to see that the influence of even one such normal school in each State must tell with great effect upon the whole department of public instruction; what, then, may we not hope when the number of them shall have been so increased and the laws regulating the licensing and the employment of teachers so amended that no country school,

however obscure, shall be without its carefully-chosen and professionally-trained teacher?

But if we had all this now, there would still be one very important lack. We are engaged in establishing a great number of scientific and technical schools, which, when once fairly founded and equipped on the basis of national, State, municipal, and private donations at present secured and in progress of acquirement, will constitute the most magnificent array of schools of the scientific professions possessed by any nation of the world. But the fact is notorious that we are at present without suitably qualified teachers for this class of schools. The department is to our educated men a new one, and but few of them are now, or will be, prepared to do the work it demands. The success of such institutions depends more upon the qualifications of their professors than upon all other circumstances combined; and success should not be hazarded by the employment of incompetent men. What, then, is to be done? Imported teachers would not answer our purpose; nor can our young men who aspire to the post of professor in these schools afford to travel the world over and spend a lifetime in gathering up the requisite knowledge and acquiring the proper professional skill in foreign lands. It seems to me clear, therefore, that we especially need, no less than France, a national superior normal school. And, inasmuch as still other classes of our superior and special schools are only one degree less needy in this regard, I would make such national school broad enough and comprehensive enough to meet the demands of all.

The early establishment of such an institution would be rendered easy, if the national government would carry but a single step further its enlightened and liberal policy of making the unoccupied public domain subserve the highest uses of civilization; and I can think of no further application of that policy that would promise the accomplishment of more good, or that would be more universally approved by the great body of our intelligent people.

UNIVERSITY EDUCATION.

CHAPTER XII.

PRESENT CONDITION OF UNIVERSITY EDUCATION.

Introduction—The original application of the term university—The modern idea of the university—University education in France—Italy—British universities—Spanish and Portuguese—German universities—University of Wurtemberg, Heidelberg, Giessen, Jena, Leipsic—Swiss universities—University education in Holland—Belgium—Scandinavian universities—Russian—University education in America—Harvard College—Yale College—Columbia College—Other university organizations in the United States—The Cornell University.

INTRODUCTION.

The original application of the term university was to associations of tradesmen in the time of the Emperor Justinian, the idea involved being that of a union of all or nearly all the individual members of a given craft or profession who were found in a particular locality; and such continued to be its sole application for several hundred years, until even the eleventh and twelfth centuries, when, in like manner, it began to be used as a designation for certain great schools of learning, since which date the university as an educational institution has assumed so many different types that even at the present time there is no little confusion and doubt in the public mind as to the precise class of institutions to which it properly applies. Thus, at the outset, the University of Bologna was a great professional school, embracing numerous associations of doctors and students devoted to the study of law; and Paris presented a parallel in the great school of theology and the scholastic philosophy, while the two English universities at Cambridge and Oxford were first distinguished as schools of philosophy and the arts.

The university of this period had no essential reference to the nature and number of the departments of study embraced, and it was not until long after the foundation of the so-called universities above named that the several schools or faculties now embraced were successively established. They were simply groupings of learned doctors and aspiring scholars animated by a common desire to acquire and diffuse the most popular knowledge of the times—a *universitas doctorum et scholarium*. But slowly the idea of forming therein a complete circle of higher culture and knowledge of every sort, represented to the eye of the public

not alone by its scholarly professors, but also by various material aids to instruction, such as libraries and collections, found place here and there, and the university took the form of the *universitas literarum et scientiarum*, embracing schools of letters; of language, literature, and philosophy; schools of science; and schools of the everywhere-recognized professions of law, medicine, and theology.

This is the signification the term still carries in the most learned communities of the present day, notwithstanding certain exceptional uses, as in the case of the University of New York and the University of London, and the gross misapplications of it so common in our own and in some other countries.

Omitting all consideration of the various steps by which this idea of the university was at last reached, as well as of the many striking peculiarities that characterized the leading universities of the past, it is my purpose, in this place, to present, as gathered from recent personal observations and inquiries in nearly all countries where the university of any type whatever exists and from official documents of latest date, first, the present actual condition of university education; and, secondly, some of its more manifest tendencies.

UNIVERSITY EDUCATION IN FRANCE.

As already stated in the foregoing chapters, France no longer has a nominal university, either at Paris, seat of the first university so-called, or elsewhere within her boundaries. But practically the institution exists just as veritably as at any period since the revolution; for, strictly speaking, the University of France, created by Napoleon I in 1808, and finally abolished, or rather superseded, by the organic law of March 15, 1850, was only a supervisory corporation, with authority to regulate the "academies," which were the only universities during the First Empire, the Restoration, and the period of the Orleans dynasty, as well as subsequently, and which, through all the changes of the past sixty years, have substantially maintained the same educational character.

Many of these academies fall short of the university standard of Germany, which denies to any institution the rank of "full university" that does not embrace the four faculties, namely, of the arts, (*philosophische Facultät*,) of theology, of medicine, and of law, for several of them include but two or three of the faculties; but in this respect they are scarcely inferior to a number of the acknowledged universities of other European countries; while almost any of them are quite superior to a majority of the institutions that claim the university title in the United States. I deem it proper, therefore, to ignore the exceptional title of the French academies, and to treat them as being what they really are, incomplete universities—a designation no less truly, though in different degrees, applicable to even the highest in rank in those countries where the university has been regarded as being very complete indeed.

Exclusive of the one in Savoy and the one in Algiers, or, in other

words, in France proper, there are, as elsewhere remarked, sixteen academies, each constituting the educational center of an academy district and embracing several departments of the empire.

The affairs of each academy, including all superior and secondary institutions of the district properly subordinate to the minister of public instruction, are managed by an academic council consisting of the rector, as president; the academy inspectors, of which there is one for each department embraced in the district, except at Paris, where the number is eight; the heads of faculties, known as deans; and seven additional members appointed triennially by the minister, and including an archbishop or bishop of the district, two ministers of the Catholic, Protestant, or Jewish church, two magisterial officers, and two public functionaries or other notable persons of the district.

The rectors are chosen by the Emperor. The faculty professors are also selected by him on the proposal of the minister and can only be dismissed by imperial order. The deans of faculties are chosen by the minister from among the professors over whom they are to preside. But neither the Emperor nor the minister can make nominations or appointments of rectors, deans, or professors independent of the organic law governing public instruction, which establishes various important conditions and tests to be fully met by all aspirants alike.

In the first place, no one can be appointed a rector or dean who is not possessed of the qualifications of a full professor; and no one can attain to the professoriate unless thirty years of age and professor of the doctorate in the faculty to a place in which he aspires, nor even then unless he has been first examined in a most thorough manner in the branches he proposes to teach and has actually served for some time as assistant professor.

Besides the full professors (styled *professeurs titulaires*) the faculties often include assistant or acting professors (*professeurs suppléants*,) honorary professors, and certificated teachers known as *professeurs agrégés*.

The *professeur suppléant* is chosen by the minister from *agrégés de faculte*, or from persons of proved ability possessed of the doctorate in the department of learning, whose faculty is to be supplied. This post of *suppléant* or adjunct is often filled by doctors of marked ability and superior attainments, in all respects competent to the duties of the *professeur titulaire*, and only holding the subordinate position, as army officers do, for want of vacancies in the places of higher grade.

The *agrégés de faculté* are persons duly authorized to teach either independently, (in which case they are called *agrégés libres*,) or in the faculty proper, should the exigencies of the service require it, in which case they are known as *agrégés* in practice.

It will, of course, be understood that the title of *agrégé* does not carry with it authority to teach in any one of the faculties at pleasure, but only in a particular faculty; nor yet in any department of a particular faculty, but only in a specific department, fitness for which has been

demonstrated in a competitive examination upon the branches included in such department. Nevertheless, there are certain general conditions or prerequisites to admission to the examinations which are common to every class of candidates for aggregation. Thus every candidate must be not less than twenty-five years of age, a native of France or a naturalized citizen, and possessed of the diploma of doctor in the particular faculty for aggregation in which he is an applicant. It is likewise demanded of all that they inscribe their names as candidates with the secretaries of the academies in their respective districts at least two months in advance of the time fixed by the minister for the examinations. There is also a certain agreement in the general character of the examinations to which all classes of candidates for aggregation are subjected, namely, in that the tests are invariably of two kinds—first, the preparatory, and, secondly, the definitive tests; though the details of said tests vary according to the nature of the service to which they are designed to admit the applicant.

FACULTY OF LETTERS.

Agrégés of the faculty of letters are certificated for ten years, and renewed by halves every five years; but they may be maintained in their rank as such or in their functions after the expiration of the time of legal exercise, or even be recalled into active exercise, should the needs of the service require it. They are divided into three sections, to wit: first, the section of ancient and modern literature; secondly, the section of philosophy; and, thirdly, the section of history and geography. The preparatory tests consist, first, in the settlement of the candidate's general qualifications and title to admission to the further tests; and, secondly, in two written compositions—one in Latin, upon a subject belonging to ancient literature, the other in French, and upon a subject of modern literature, history, or philosophy, according to the section in which aggregation is desired. Having satisfactorily passed the preparatory tests the candidate is admitted to such as are considered definitive, and which for this particular faculty consist of an argumentation and two oral lessons. The argumentation bears, for the first section, (literature, ancient and modern,) upon the grammatical and literary construction of Greek, Latin, and French texts, and, if the candidates desire it, upon texts taken from foreign literatures; for the second section, (philosophy,) upon the literary and philosophic interpretation of some of the principal works of Greek, Latin, and French philosophy; for the third section, (history and geography,) upon the literary and historic interpretation of some of the principal works of Grecian, Latin, and French history. The two lessons are given by the candidate as to a class, and pertain in like manner to the subjects embraced in the section in which the prospective *agrégé* intends to teach.

FACULTY OF SCIENCES.

Agrégés of the faculty of the sciences are certificated for a like period and the authority granted them is renewable in like manner. They are

likewise divided into three sections: first, the section of the mathematical sciences, pure and applied; secondly, the section of physical sciences; and, thirdly, the section of the natural sciences. The preparatory tests in this case consist, first, in a verification of the candidate's general qualifications, as established by the diploma of doctor and other documentary evidences; and, secondly, a composition upon a subject belonging to the order of instruction for which the candidate is inscribed. The final or definitive tests consist of an oral lesson and a written argumentation. The argument consists of a thesis upon some one of the subjects announced in the official programme of the examinations six months in advance. The oral lessons, to be given by the candidates as to a class, are, for the mathematical section, upon mathematical analysis, mechanics, or astronomy, at the option of the candidate; for the physical section, upon physics or chemistry; for the natural science section, upon some branch of natural history.

FACULTY OF LAW.

Agrégés of the faculty of law also regularly enjoy the title, and exercise the functions appertaining, for the period of ten years, and the conditions of a renewal or extension there are the same as in the faculties of letters and science. They are also divided into three sections, namely: first, of Roman law; secondly, of civil and criminal law; and, thirdly, of administrative and commercial law. The preparatory tests are three: first, the verification of the qualifications for admission to the examinations prerequisite to the title; secondly, a written and printed dissertation on Roman law; thirdly, a lecture belonging to the order of instruction for which the candidate is inscribed. The definitive proofs consist of two oral lessons and two argumentations. Of the two lectures, one bears upon the Code Napoléon, the other relates to the particular order of instruction for which the candidate is inscribed. Of the two argumentations, one must be upon a title of the digest, and the other upon a subject drawn from the particular order of legal instruction for which the candidate is inscribed.

FACULTY OF MEDICINE.

Agrégés of the medical faculty do not enter actively upon the performance of their functions until after the expiration of three years from the date of admission. The duration of their functions when admitted to take part in the examination of students and to replace professors is six years for the faculty, at Paris, and nine years for the faculties at Montpelier and Strasbourg. Every three years the *agrégés* in practice are renewed; by halves in the faculty of Paris, by thirds in the other two faculties. They are divided into four sections: first, for the anatomical and physiological sciences, including anatomy, physiology, and natural history; secondly, for the physical sciences, including physics, chemistry, pharmacy and toxicology; thirdly, for medicine properly so called and for medical jurisprudence; and, fourthly, for surgery and obstetrics. The

preparatory tests are, first, the usual determination of preliminary qualifications; secondly, a dissertation upon an anatomical and physiological question; thirdly, a lecture upon some subject belonging to the section for aggregation in which the applicant is candidate. The final tests consist of a lecture, practical proofs, and an argumentation. The lecture is given upon a subject belonging to the order of instruction for which the candidate is inscribed. The nature and number of the practical tests imposed upon each candidate are determined by the president, after consultation with the members of the jury of examiners. The argument required is embodied in a thesis upon some subject belonging to the section in which aggregation is sought by the candidate.

FACULTY OF THEOLOGY.

In the faculties of theology the instruction is exclusively given by professors and adjunct professors, who for the Catholic faculties are named by the Emperor, upon the proposition of the minister of public instruction and the presentation of the archbishop or bishop of the diocese, and for the Protestant faculties upon the presentation of the religious authority, after the votes of the consistories collected by the central council.

SCHOOLS OF PHARMACY.

In the superior schools of pharmacy, which are branches of the three medical faculties, the conditions to be complied with, in order to gain admission to the rank of *professeur titulaire*, *professeur suppléant*, or *agrégé*, are quite identical with those already named; thirty years of age, the possession of the degree of doctor in the physical sciences, and the diploma of *pharmacien* of the first class, and the having for two years given a course of instruction analogous to those given in the superior schools of pharmacy being essential to admission to the examinations prescribed for the professoriate, and twenty-five years of age and the possession of a diploma of doctor in the physical or natural sciences, and that of *pharmacien* of the first class, essential to admission to the examinations for aggregation. The professors are named by the Emperor upon the proposition of the minister, who chooses them either from among the candidates provided with the qualifications above named, or from the members of the Institute of France, or upon a double presentation made by the school in which the vacancies exist and by the academic council. The *agrégés* are required to undergo a series of most thorough examinations. There are, also, in the schools of pharmacy, adjunct *professeurs*, who are required to be twenty-five years of age, and to have the degree of licentiate in the physical sciences, and the diploma of *pharmacien* of the first class, and who are named by the minister.

NUMBER OF PROFESSORS AND INSTRUCTORS.

I have been thus particular in detailing the manner in which instructors are obtained for the universities of France, in order that it may again appear how exceedingly careful the French government is to insure

to the highest institutions of learning a correspondingly high grade of qualifications. It remains but to add that the compensation accorded does equal honor to the intelligence and liberal spirit of the government. In Paris, the salary of a full professor, as well as of the academic inspector, is 12,000 francs, an amount fully equal, relatively, to $4,000 in the United States. Besides which, the professor, being occupied but for a few hours a week, and free to employ his leisure time in any manner that suits his convenience, may, if he desires to do so, add to this income from other sources. But the French professors are students, and seldom go out of their legitimate field.

The result of this policy appears in the fact that the French professors are not only among the very ablest in the world, but are held in the highest honor by both people and government.

A complete academy embraces the following faculties: a faculty of sciences, a faculty of letters, a faculty of theology, a faculty of law, and a faculty of medicine. But the only ones including all these five faculties are those of Paris and Strasbourg. The faculties of letters and science are found in all, faculties of theology in six, faculties of law in eleven, faculties of medicine in three.

The number of chairs and the titles of professorships are different in the various academies, scarcely any two agreeing perfectly in these respects.

Thus the Academy of Paris has a faculty of theology with seven full professors and two *suppléants*; a faculty of law, with nineteen full professors and six *agrégés*; a faculty of medicine, with twenty-five full professors, three *suppléants*, five honorary professors, two *agrégés* in charge of complementary courses, and twenty-two *agrégés en exercise*, together with a branch superior school of pharmacy, including nine professors, one *suppléant*, and seven *agrégés*; a faculty of science, with seventeen full professors, four *suppléants*, two honorary professors, and three *agrégés*; and a faculty of letters, with eleven full professors, four *suppléants*, one professor in charge of a complementary course, three honorary professors, and nine *agrégés*.

The Academy of Aix has a faculty of science, with six professors and six *agrégés* in charge of complementary courses; a faculty of letters, with five professors and one complementary *agrégé*; a faculty of law, with nine professors and three *agrégés*; and a faculty of theology, with five professors.

The Academy of Besançon has a faculty of sciences, with six professors, and a faculty of letters, with five professors.

The Academy of Bordeaux has a faculty of sciences, with six professors; a faculty of letters, with five professors; and a faculty of theology, with six professors.

The Academy of Caen has a faculty of letters, with five professors; a faculty of sciences, with five professors and one complementary; and a faculty of law, with seven professors and one *agrégé*.

The Academy of Clermont has a faculty of the sciences, with four full professors and two *suppléants*, and a faculty of letters, with five professors and one *suppléant*.

The Academy of Dijon has a faculty of science, with five professors; one of letters, with five professors; and one of law, with seven professors and two *agérgés*.

The Academy of Douai has a faculty of sciences, with seven regular chairs and two complementary courses; a faculty of letters, with five professors; and a faculty of law, with eight professors and two *agrégés*.

The Academy of Grenoble has faculties of the sciences and of letters, with five professors each, and a faculty of law, with eight professors, two complementaries, and two *agrégés*.

The Academy of Lyons includes a faculty of letters, with five professors, one of the sciences, with seven, and one of theology, with six.

The Academy of Montpellier has a faculty of letters, with six professors; a faculty of the sciences, with eight professors; and a faculty of medicine, with seventeen professors, two complementaries, and thirteen *agrégés*.

The Academy of Nancy has a faculty of letters, with five professors, one of science with four regular chairs and one complementary course, and a faculty of law, with seven professors and three complementaries.

The Academy of Poitiers embraces a faculty of letters, with five chairs, one of the sciences, with four, and one of law, with ten professors and two *agrégés*.

The Academy of Rennes has a faculty of letters, with five professors, one of the sciences, with four, and one of law, with seven professors and four *agrégés*.

The Academy of Strasbourg, as before remarked, includes all the faculties, to wit: one of letters, with five professors; one of the sciences, with six; a faculty of medicine, with seventeen professors, two *agrégés* in charge of complementary courses, and sixteen *agrégés en exercise;* a faculty of law, with ten professors, and a faculty of theology, with six professors.

And the Academy of Toulouse embraces a faculty of letters, with five professors; a faculty of the sciences, with eight professors; a faculty of law, with eleven professors and three complementaries; and a faculty of theology authorized but not yet organized.

There is, also, subject to the academic council of Caen, a faculty of theology, with five professors, at Rouen, which makes the whole number of faculties of theology seven.

The subjects giving title to the professorships in the faculties having the minimum number of professors are substantially as follows:

In faculties of letters: philosophy, French literature, ancient literature, foreign literature, history.

In faculties of the sciences: pure mathematics, astronomy, and rational mechanics; botany, geology, and mineralogy; physics, chemistry.

In faculties of medicine: anatomy, physiology; medical chemistry and pharmacy; botany and medical natural history; hygiene; operations and apparatus; medical pathology; surgical pathology; materia medica and therapeutics; general and medical chemistry and toxicology; pathology and general therapeutics; medical jurisprudence; obstetrics and diseases of women and children; surgical clinic; medical clinic, together with various complementary courses, usually upon special diseases or classes of disease.

In faculties of law: Roman law; the Code Napoléon; civil procedure and criminal legislation; commercial law; administrative law.

In faculties of theology: dogmatic theology; Christian morals; Hebrew language; ecclesiastical history and discipline; the Bible; sacred eloquence.

The titles of the eighty-eight chairs embraced in the five faculties and superior school of pharmacy of the great Academy of Paris, with its eighty-eight full professors, ten *suppléants*, ten honorary professors, and fifty *professeurs agrégés*, have been already given in the chapters on schools of letters, science, medicine, law, and theology, respectively, and need not be repeated in this connection. But one or two universities in the world present a greater number of important chairs of instruction, and none a more brilliant array of distinguished savans composing its professional corps. One advantage is lost to this association of university faculties by reason of the diversity of their locations. The faculties of letters, science, and theology are located at the Sorbonne, but the other faculties are scattered, that of medicine being found in the *Place de l'École-de-Medecine*, the faculty of law in the *Place du Panthéon*, and the school of pharmacy in the *Rue de l'Arbalète*.

ADMISSION, DEGREES, NUMBER OF STUDENTS.

Admission to the courses of instruction offered by the French faculties requires a degree of educational qualifications about equal to that demanded for admission to most European universities. For admission to the faculties of letters and science, the candidate must be possessed of such qualifications as are attainable at the *lycées*, such as are represented by the diploma of bachelor granted by a majority of our American colleges. Admission to the faculties of law and theology requires the possession of the diploma of bachelor of letters; to those of medicine and to the superior schools of pharmacy, the diploma of bachelor of science.

The degrees conferred by all the faculties are those of bachelor, licentiate, (equivalent to our master,) and doctor. They are conferred in no case without thorough examinations of the candidate, and they must be taken in order; possession of the lower degree being a prerequisite to admission to the examinations necessary to the next higher degree. In the faculties of letters and science the lowest degree is conferred upon examination merely, without reference to the term of study. But the

privilege of examination for the doctorate in none of the professional faculties can be accorded unless the candidate can show that he has spent at least the equivalent of four years of study in a faculty of that order. I say *equivalent* because examinations for the doctorate in medicine are allowable where the candidate has spent three and a half years in an *école préparatoire de médicine* and one year in a faculty; and in theology where the candidate has spent three years in a theological seminary and taken four inscriptions in a faculty of theology.

The students in attendance upon the French faculties board where they choose, and only visit the place of instruction to listen to the lectures or to engage in such practical exercises as properly belong to their respective courses of study.

The expense of a full course of study requisite to the degree of bachelor—tuition, examinations, and diploma included—is about 600 francs; to the degree of doctor, about 1,300 francs.

The support of the faculties is derived in part from these fees paid by the students, and in part from the state, which annually appropriates large sums for this purpose. Last year (1867) their share in the annual budget for public instruction amounted to 3,828,821 francs.

The total number of students in annual attendance upon the 48 faculties embraced in the 16 French universities is about 24,000, or one for every 1,900 inhabitants. The average number per academy, therefore, is no less than 1,500; per faculty, 500. The actual distribution, however, is very different from this average; for scarcely less than between 14,000 and 15,000 of the whole number are found in the great faculties of Paris, thus reducing the average for the 15 country academies to about 640 students.

The distribution by faculties of the students at Paris—assuming the whole number to be 14,500—is very nearly as follows:

Students of science, 100 [1]; students of letters, 1,900; students of theology, 200; students of medicine, 4,300; students of law, 8, 000.

In view of the foregoing facts and figures, we may reiterate the question, by what authority they assert it, who declare that in France the university is extinct.

THE UNIVERSITIES OF ITALY.

University education in Italy has long suffered, and is still suffering, from several causes, prominent among which are excess in number of the institutions of that class, the long-continued, illiberal domination of the church over the educational interests of the country, and a decline of the spirit and pride of nationality, consequent on the disintegration of the kingdom.

The last-named causes have, of late, been, in great measure, removed; but the political changes wrought since 1848 have not yet led to that

[1] The small number of students in the *faculté des sciences* is accounted for by the relatively large number attracted to those great scientific centers, the *Collége de France* and the *Muséum d'Histoire Naturelle.*

consolidation and reorganization of the universities, without which high character and efficiency are impossible.

From the foundation of the University of Genoa, in 1812, to the conclusion of the Prusso-Austrian war of 1866, which restored the province of Venetia, and, as a matter of course, replaced the ancient and once famous University of Padua among its old associates, the number of Italian universities was 19; of which 16, those of Bologna, Cagliari, Catania, Genoa, Macerata, Messina, Modena, Naples, Palermo, Parona, Pavia, Pisa, Sassari, Sienna, and Turin were and are still institutions of the state; while those of Camerino, Ferrara, Perugia, and Urbino are free or independent. The recovery of Padua, therefore, raises the number of royal institutions to 16, and the whole number to 20. There are also institutions at Rome and Florence, which, including, as they do, a portion of the teaching given in the university faculties, are sometimes ranked as universities. Admitting these, the number would be 22. But, as they are in no proper sense universities, and are not so treated by the government, there seems to be no propriety in their inclusion.

MAINTENANCE OF ROYAL UNIVERSITIES.

The royal universities are sustained by a fund derived in part from the rent of property originally their own by inheritance but now managed by the state, in part from the fees paid by students, and in part from appropriations made by the government. But in few cases do the rents and the fees together constitute more than about one-half the whole cost of maintenance, and in most a much less percentage than that. Formerly the property of the universities was managed by the institutions themselves; but, at present, the revenues of every sort are paid into the treasury of the state, which assumes the responsibility of making up all deficiencies however great.

Thus the total cost of maintaining the government universities at the present time is no less than 5,500,000 francs per annum; while the total revenue from their several properties is considerably less than 1,000,000 francs, and the total of fees paid by students but little more than 500,000 francs. Stating the amount in round numbers, therefore, it may be said that the fifteen royal universities of Italy are an annual expense to the government of some 4,000,000 francs, or more than four times the cost to the French government of maintaining the faculties of Paris and of the departments. The amount actually expended upon the French faculties is about 3,500,000 francs per annum; but so large an amount comes back in the form of fees that less than 1,000,000 francs is actually drawn from the state.

As a convenient method of stating this matter of cost and sources of revenue more in detail, I present the following table, the material for which has been derived in part from the officers of such of the universities as I was enabled to visit, and in part from the very able report of Signor Matteucci. (*Sulle Condizioni della Publica Istruzione nel Regno d'Italia*, 1865.)

Table showing the sources of their revenue and the total annual expenses of Italian universities.

Universities, royal and free.	Income from university property.	Income from tuition fees.	Deficiency supplied by the State.	Total expenses per annum.
ROYAL UNIVERSITIES.	*Francs.*	*Francs.*	*Francs.*	*Francs.*
Bologna	15,000.00	26,000	454,574.12	495,574.12
Cagliari	....	4,439	....	155,772.00
Catania	75,000.00	29,480	87,466.63	191,946.63
Genoa	(*)	20,000	234,667.00	254,667.00
Macerata	(*)	4,000	....	....
Messina	25,661.56	8,766	85,732.21	120,179.77
Modena	(*)	31,784	....	217,389.72
Naples	(*)	160,000	....	678,976.84
Palermo	144,138.46	21,382	258,952.91	424,473.37
Parma	(*)	21,000	....	193,485.35
Pavia	10,500.00	83,984	298,773.28	392,767.28
Pisa	88,200.00	50,000	292,147.47	430,347.47
Sassari	(*)	4,500	....	53,996.00
Sienna	48,782.52	8,000	64,968.98	121,951.50
Turin	....	71,730	....	619,881.00
FREE UNIVERSITIES.				
Camerino	35,469.23	2,745	....	(*)
Ferrara	36,351.00	8,300	....	(*)
Perugia	46,664.00	5,100	....	(*)
Urbino	67,201.00	3,000	....	(*)

* Amount not definitely ascertained.

The distribution of the several sums total above given, in the year 1865, was as follows:

Table showing the distribution of the several sums total in the year 1865.

Name of university.	Personal direction, instruction, and other service.	The secretariat, service, and material.	Scientific establishments belonging to the universities.	Buildings and repairs.	Extraordinary expenses.	Incidentals.	Total expenses.
	Francs.	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*
Bologna	304,900.00	21,872.96	135,113.00	7,300.00	18,000	8,388.16	495,574.12
Cagliari	99,550.00	8,900.00	35,022.00	1,200.00	8,500	2,600.00	155,772.00
Catania	129,620.00	14,485.00	37,260.00	2,200.00	5,000	3,381.63	191,946,63
Genoa	144,425.00	18,000.00	71,092.00	3,550.00	17,000	600.00	254,667.00
Messina	95,160.00	9,965.00	13,354.77	1,500.00	....	200.00	120,179.77
Modena	134,410.72	11,890.00	65,293.00	1,200.00	3,096	1,500.00	217,389.72
Naples	343,400.00	37,800.00	243,776.84	18,000.00	28,000	8,000.00	678,976.84
Palermo	276,150.00	21,446.00	85,078.00	4,449.37	35,000	2,300.00	424,473.37
Parma	126,810.00	12,350.00	49,560.00	1,500.00	2,000	1,265.35	193,485.35
Pisa	293,743.27	18,700.00	88,991.40	8,090.00	18,000	2,822.80	430,347.47
Sassari	37,050.00	5,946.00	9,400.00	700.00	....	900.00	53,996.00
Sienna	87,581.00	7,720.50	23,502.00	1,554.00	....	1,594.00	121,951.50
Turin	311,000.00	31,160.00	212,200.00	20,300.00	36,521	8,700.00	619,881.00

FACULTIES OF THE UNIVERSITIES.

The faculties embraced in what, in Italy, is regarded as a complete university are those of theology, law, medicine and surgery, science and

letters;[1] in which respect there is a perfect accordance with the plan of division in France, although the whole five faculties are found together in none of the French universities except those at Paris and Strasbourg.

The sixteen royal universities embrace sixty-three faculties; which comes within a small fraction, it will be observed, of an average of four faculties per university. Those embracing the five faculties are the universities of Cagliari, Catania, Genoa, Padua, Palermo, Pisa, and Turin. The universities embracing four faculties are those of Bologna, Messina, Naples, and Pavia. The royal universities of Modena and Parma and the free universities of Ferrara and Perugia include three faculties, while the royal university of Macerata, which scarcely deserves the title, and the free universities of Camerino and Urbino each embrace only two faculties; the first two those of law and medicine, and the last-named, those of law and science.

It should be remarked, however, that besides these full faculties there are several "courses" and "schools" connected with the universities of Italy, many of which are provided with large and able corps of instructors, entitling them to such importance that if they were established in connection with American universities they would rank as departments or colleges. Thus, Bologna, Perugia, and Urbino each include a course in veterinary science, *(corso di veterinaria,)* with twelve, six, fourteen, and thirteen professors respectively; Modena and Parma embrace courses in practical engineering, *(corso speciale per i praticanti ingegneri,)* with five and four professors each; Perugia includes a triennial course in the theory and practice of agriculture and of surveying; while Bologna, Cagliari, Macerata, Modena, Naples, Palermo, Parma, Pavia, Pisa, Sassari, Sienna, Turin, Ferrara, Perugia, and Urbino have each a regular school of pharmacy, with six to nine professors.

The principal officers in charge of the Italian universities and of their several faculties and scientific establishments are an administrative officer, usually styled the rector, but in some cases, as in those of Bologna and the free universities, designated as the regent; a secretary, with several assistants; a president at the head of each of the faculties embraced; and a director, with one or more assistants, in charge of each of the scientific establishments connected with the university. In many cases the regent or rector is favored with an advisory council, consisting of the presidents of the several faculties, and variously known as the council of the regency, the academic council, &c., and in a few cases there are also a vice-rector subordinate to the rector and deans of faculty, second in rank to the presidents.

The number of chairs of instruction in the 20 universities of the kingdom is 1,524; of which 61 belong to the faculties of theology; 307, to the faculties of jurisprudence; 495, to the faculties of medicine and surgery; 346, to the faculties of the physical, mathematical, and natural sciences; 154, to the faculties of philosophy and letters; 53, to the schools

[1] The newly recovered university constitutes an exception, however, substituting the faculties of mathematics and philosophy for those of science and letters.

of engineering and to the veterinary schools connected with the medical faculties; 97, to the schools of pharmacy; and 41, to the suppressed facultative schools *(scuole facultative)* of Piacenza, lately united with the University of Parma.

The instruction in the twenty Italian universities is given by some 1,400 professors and teachers of different grades; the largest number (230) being found in the University of Turin.

The professors are known as ordinary, extraordinary, *in caricati,* (professors extraordinary specially charged with courses of instruction,) substitutive, (professors of high qualifications, capable of assisting or relieving the regular or ordinary professors, and, in Italian, called *supplenti,*) *honorary,* and *emeritus* professors. There are likewise three classes of teachers, who, although they have not yet attained to the rank of professor, are found in greater or less number in the universities, and not unfrequently among the ablest members of the instructional corps, to wit: *assistant* professors, *(assistenti,) adjunct* professors, *(aggiunte,)* and private lecturers or *privat-docenten, (docenti privati.)*

The proportionate number of these respective classes of professors and teachers in both the royal and the free universities of Italy will be found concisely stated in the following table:

Statement of the number of faculties and special schools, courses, &c., with the number and character of the instructors in each, embraced in the several universities of Italy.

Universities.	Faculties proper	Schools and courses.	Professors of various grades.					
			Ordinary.	Extraordinary.	In caricati.	Honorary and emeritus.	Agrégés, (Aggregati.)	Total number instructors.
Bologna	4	2	46	5	1	3		109
Cagliari	5	4	24	6	6	7		80
Camerino	2	4	15	......	15	6	14	50
Catania	5	2	23	8	......	......	1	32
Ferrara	3	1	6	13	4	9	......	32
Genoa	5	1	37	5	1	5	66	114
Macerata	2	3	15	1	7	3	16	42
Messina	5	3	16	16	......	......	......	32
Modena	4	3	35	2	......	8	......	45
Naples	4	......	46	8	......	23	......	77
Padua	5	3	40	5	3	......	9	57
Palermo	5	4	44	7	3	1	......	55
Parma	5	3	34	4	8	50	......	96
Pavia	4	1	40	4	3	2	......	49
Perugia	3	5	27	......	......	8	8	43
Pisa	5	......	47	......	8	44	......	99
Sassari	3	3	11	6	4	10	35	66
Sienna	2	2	24	1	......	23	......	48
Turin	5	1	50	19	2	28	131	230
Urbino	2	5	19	4	8	......	8	30
	78	50	509	118	73	230	379	1,399

Touching the character of the faculty professors in Italy, their selection, service, and compensation, it may be remarked in general terms that at the present time they are hardly up to the French, and very decidedly below the German, standard; not in native ability, nor yet, perhaps, in scholarship; for very many of them are men of the first ability, and first also in social and civil life. But the universities and all connected with them have partaken of the educational spirit of the country, which, as before intimated, is sadly in need of an infusion of new energy and a higher ambition. Accordingly, instead of the zealous and laborious service performed by French and German professors who are accustomed to give from ninety to one hundred and twenty lectures each during the year, sixty or seventy is the maximum number; which, for the period embraced in the collegiate year, is less than two per week. While, therefore, the compensation allowed to a professor is small, it is not, after all, very disproportionate either to the compensation of men in other pursuits or to the amount of service actually rendered.

The law of 1862 fixed the salaries of professors in the smaller universities at $600 to $720; in the principal universities, at $1,000 to $1,200.

A noticeable fact in relation to the instructors is the small number, relatively, of private teachers in most of the universities in proportion to the number of ordinary professors—the exact reverse of what is so observable in the universities of Germany, and of that, wherever found, which indicates the highest degree of intellectual activity.

NUMBER OF STUDENTS.

The universities of Italy are, in the aggregate, far less numerously attended than those of France; the whole number of students in annual attendance scarcely exceeding ten thousand, or one student for about every two thousand two hundred inhabitants. And when it is understood that nearly one-half of this whole number must be set down to the credit of the university of Naples, at which the attendance ranges between three thousand and five thousand, it becomes apparent that the majority are but little frequented.

According to Signor Matteucci, there are in Italy but 4 universities that exceed 1,000 students, to wit: Naples, Turin, Pavia, and Padua. Of the remaining 16, 5 (Cagliari, Camerino, Macerata, Sassari, and Urbino) have less than 100 students, 4 (Ferrara, Messina, Perugia, and Sienna) have but little more than 100 and less than 200 each, and 7 (Pisa, Bologna, Modena, Genoa, Catania, Parma, and Palermo) number from 200 to 700 pupils each.

It needs to be borne in mind by the American reader, however, that the students in attendance upon the universities, as upon most of those in European countries, are advanced pupils, already possessed of such qualifications for the professional and other higher studies as are attainable at the royal lyceums and as are equivalent to those represented by a majority of American colleges.

University students in Italy are divided into stndents and auditors.

According to the royal decrees of 1862 and 1864, it is necessary, in order to be admitted to the university stndies, to produce the certificate of *licenza liceale*, to undergo the examination for admission prescribed for the facnlty to whose studies the applicant seeks admission, and to pay the prescribed price of inscription. Auditors, (*uditore*,) or such as attend upon the lectures and demonstrations of the professors without aiming at university degrees, must also produce the certificate of *licenza liceale* and pay one and a half times the regular fee, bnt are exempt from the preliminary examination.

The price of inscription varies somewhat for the different faculties, bnt is, in general terms, lower than in any other country of Europe, being only 38 to 102 francs per annum for all the studies which lead to a given diploma, or 155 to 410 francs for an entire course of three to six years. The highest fees are demanded by the facnlties of jnrisprudence, the lowest by the facnlty of letters and philosophy, as will appear by the following tabular statement:

Fees for instruction from various faculties in Italy.

Faculty.	No. years of course.	Fees per annum.	Total fees for course.
		Francs.	Francs.
Letters and philosophy	4	38.75	155
Physical, mathematical, and natural sciences	4	60.00	240
Medicine and snrgery	6	46.67	280
Jnrisprudence	4	102.50	410
Theology	4	86.50	346

Poor students distinguished in their studies, as shown by the *certificato della licenza* and the preliminary examination, or by their standing at the university during the preceding year, are favored with a remission of fees; but the same is not true of the *uditore*, who are only admitted on payment of the fees.

In the preceding chapter mention was made of the great number of colleges established in connection with many of the Italian universities for the free support *in toto* of students needing aid. Some few of these interesting relics of the Middle Ages yet remain. But the *Collegio Ghislieri* and *Collegio Borromeo*, the former with sixty-six and the latter with twenty-eight full maintenances, are almost the only ones left. At Turin, however, in the university and in the *Collegio delle Provincie* there are nearly two hnndred free supports provided for stndents. Still, the total amount annually expended by the state in this manner does not now exceed about $30,000.

As to the distribution of pupils among the different faculties, the most notable and important fact is the exceedingly small proportion of those

who devote themselves to the study of letters, science, and philosophy, especially of letters and philosophy, and the very large porportion who enter the faculties of medicine and jurisprudence. Indeed, the number of the former is almost too insignificant, in some of the universities, to demand mention. For example, in 1864 the University of Pavia, with a total of 1,204 students, had but eight in the faculty of letters; and at Bologna, where the total number of students in the four faculties of law, medicine, science, and letters was 489, but 33 were found in the last-named faculty. Turin is almost the only exception to this general rule.

Presented a little more in detail for a few of the universities, including some of the most and some of the least numerously attended, this peculiarity is illustrated by the following tabular statement of facts gleaned from the statistics of 1864 and 1867:

Table showing the number of faculties and the number of students.

University.	No. of faculties.	Whole No. students.	In faculty of law.	In faculty of medicine.	In faculty of sciences.	In remaining faculties.
Bologna	4	489	129	181	146	33
Genoa	5	238	87	48	37	66
Modena	4	466	185	77	120	84
Padua, 1867	5	1,440	633	410	362	33
Pavia, 1867	4	1,023	329	284	332	78
Turin	5	1,003	393	172	110	328

In some cases this neglect of the literary and philosophical studies, and this almost exclusive devotion to the professional ones—the *bread studies* as the Germans call them—is so entire that there have been years in which some of the universities have not conferred a single degree in letters or philosophy.

Within a very few years there has been some increase in the proportion of students in the faculties of the mathematical, physical, and natural sciences; but even this is attributed by the leading educational men of the country, not to a growing love of those studies for their educational value so much as to the fact that they are more and more coming to be regarded as prerequisite to the most successful practice of the industrial arts, to which the recent political changes have given a new impetus, and upon which the present times are making greater and more constant demands.

The term of study and the courses of instruction in the several faculties of the Italian universities have been given already in the chapters on professional schools, to which the reader is referred for particular information. The term of study requisite to examination for degrees being in no case less than four years and in the faculty of medicine six, the courses of study subdivided and very complete and the means of illustration ample, there appears to be nothing wanting but thorough

discipline and living zeal on the part of the management to insure a high degree of scholarship. But there lies the chief difficulty. The discipline is deplorably lax; the students doing much as they please, not unfrequently quitting one institution and seeking another, where the final examinations are believed to be easier; and, according to Signor Matteucci, sometimes leaving almost in a body, before the close of the term or year, as the notion takes them.

The degrees of doctor conferred in the various faculties are as follows:

In the faculty of jurisprudence, doctor of juridical science and doctor of politico-administrative science.

In the faculty of medicine and surgery, doctor of medicine and surgery.

In the faculty of the physical, mathematical, and natural sciences, doctor of pure mathematics, doctor of physico-mathematical science, doctor of physical chemistry, and doctor of natural history.

In the faculty of letters and philosophy, doctor of letters and doctor of philosophy.

In the faculty of theology, doctor of theology.

Where a condition of things exists like that hinted at above, it may be inferred that the degrees are not fenced in by the most rigid and thorough examinations possible; a presumption confirmed by the report already quoted, *(Sulle Condizione, etc.,)* in which the masterly author, ambitious for the advancement of every department of Italian education, laments the fact that there are nine or ten universities by which, during a long course of years, there was not one pupil rejected at the examinations for the degrees. But, as an offset to these, there are several in which the black balls appear to have been used with quite unsparing hand. For example, during the decade embraced between 1855 and 1865, Parma examined 737 candidates, approving 637, (with distinction, *con plauso*, 43,) and rejecting 57; Pisa examined 1,054 candidates, sending out 710 approved, (279 *con plauso*,) and rejecting 74; and Naples, still more careful of her honors, out of the whole number of 6,710 examined, approved 5,660, (370 *con plauso*,) and rejected 680.

But nothing is more manifest than that a thorough reorganization under the inspiration and resolute guidance of a wise and strong leader, backed by the power of the government, is a pre-requisite to the recovery and maintenance by Italy of the supremacy in university education once enjoyed by her, and for which, by reason of that eminent love of fine culture for many centuries characteristic of the Italian mind, she seems so well fitted. Happily for her future, and for the progress of true learning everywhere, the superior council of the kingdom has already taken the initiative in this important work, by forcibly presenting the importance of many reforms, most, if not all, of which are likely to be made at an early day.

BRITISH UNIVERSITIES.

Contemporaneous with those of France and Italy in their origin, the universities of England have undergone so few radical changes during the more than six hundred years of their history, that, except the universities of Sweden, they more nearly present the original type than any other institutions of this class in Europe. They do not still preserve the *national* feature by which all the universities of the twelfth and next subsequent centuries were characterized, but the college feature of which, as I have said before, there remain but two or three rélics in Italy, is still prominent; indeed, it constitutes their chief peculiarity. On the other hand, they have shown less tenacity than the continental universities in the matter of preserving distinct and well-organized faculties, of which there can be said to be none now in the two ancient universities of Cambridge and Oxford.

These famous institutions, as remarked in the chapter on schools of letters, are in fact not universities at all in the sense of being a cluster of schools, literary, scientific, and professional, with the purpose of representing every department of human learning, but simply federations of numerous colleges—Oxford including 24, and Cambridge 17—all of the same type, and having for their chief, we may almost say their only object, the advanced general culture of those who attend them.

ORGANIZATION AND GOVERNMENT.

Each college is a separate corporation with its own governing body, consisting of a head elected for life, and variously known as president, rector, provost, master, principal, or dean, and of numerous fellows—graduates of the university elected to the enjoyment, during celibacy, of certain incomes accruing from numerous ancient foundations. Each college has also its own statutes, with the power subject thereto of making laws for itself. The teachers in the several colleges are known as tutors, and are generally chosen from among the fellows, as are likewise the administrators of college discipline, called deans or censors.

The relation of the colleges thus organized to each other and to the university proper is very analogous to that sustained by the several States of the American Union to each other, and to the federal or national government; for, although to a certain extent independent, each college is, nevertheless, bound by the general laws of the university and is represented in the federal government, which consists of two branches, the legislative and the executive.

The executive officers of the university are a chancellor, a high steward, a vice-chancellor, a commissary, a public orator, and various subordinate officers, such as moderators, scrutators, proctors, pro-proctors, an assessor, registrar, librarian, &c. The Oxford—and I believe also the Cambridge—chancellor is elected for life by the university convocation, and for some centuries has been some nobleman of distinction.

The vice-chancellor, who is the active head of the university, as also some of the other remaining executive officers, are nominated by the chancellor and confirmed by the convocation. The proctors are chosen from among the masters of arts out of the several colleges in turn, and are charged with the enforcement of the laws. The orator is appointed by the convocation to prepare the public letters, addresses, &c., for the university.

The legislative department of the university government is somewhat differently constituted in these two universities. At Cambridge it consists of the senate and the council of the senate; the senate being composed of two houses—the regents' house and the non-regents' house—and the council of the senate consisting of the chancellor, the vice-chancellor, four heads of colleges, four university professors, and eight other members of the senate. At Oxford there are three legislative bodies—the hebdomadal council, composed of the chancellor, vice-chancellor, six heads of colleges, six university professors, and six members of convocation; the house of congregation, consisting of all the leading officers of the university, heads of colleges, professors and assistants, public examiners, and finally all resident members; and, thirdly, the house of convocation, comprising the house of congregation with the addition of all masters of arts in their first year and persons who have been regents, but have retired from the university.

The hebdomadal council has the right to initiate new measures, but all statutes framed by it must have the approval of the other two bodies. The house of congregation enjoys the prerogative of granting all the degrees, graces, and dispensations; and the house of convocation is engaged only with the most important affairs.

The whole number of members inscribed on the books of each of these universities, as members of the various bodies, is some seven thousand or eight thousand.

The professors, numbering about thirty-five at Cambridge, and forty at Oxford, are among the ablest and most learned men of the kingdom, and the chairs they hold are regarded as places of high honor. But the college tutors, of whom there are some one hundred in the twenty-four colleges and halls of Oxford, and seventy-five in the seventeen colleges of Cambridge, are, as elsewhere remarked, young men of but little experience, and often of little development, who hold their places rather as a matter of convenience and present advantage than of choice, and who cannot be supposed, therefore, to do the best quality of work.

Since the days of Newton, Cambridge has been the most noted seat of the mathematical sciences in England, and very recently, both here and at Oxford, the natural sciences, history, jurisprudence, and political economy have been admitted to places of honor. Indeed, in a certain irregular, unsystematic way, more or less instruction is now given in branches of study belonging to the five faculties constituting a French or Italian university. But the professoriate has been of slow growth,

as of a graft upon an uncongenial stock, and thus far the result has been very inferior to what it might have been under a proper organization, or even without organization, had measures of some sort been adopted to secure the attendance of students upon the lectures given. But the task imposed by the college has been the regular work of the student, and the courses of lectures by the university professors are still regarded, and by the great body of students treated, as bringing with them extra labors, which may be accepted or neglected as it may suit their taste or convenience. The theory on which the educational system is based, therefore, is this, viz., that the true object of such institutions is formation rather than information of the mind, and that, in order to this, both the intellectual training and the moral control characterizing the collegiate system are essential. Learning and research are denied to be the legitimate end or even a leading object of university education, and the doctrine that it is safe to leave young men to form their own religious views is regarded as no less heretical and dangerous.

The drill of the grammar school, the regular inculcation of religious principles, as approved by the state church, and the final oath of allegiance thereto of all who aspire to the doctorate, or even the master's degree, are accordingly insisted upon with a positiveness and a vehemence that strongly savor of the old religious bigotry and intolerance of the Middle Ages. But, then, there is another view that may be taken of this particular phase of Cambridge and Oxford, and one that we are bound to take before we pass final judgment. They were originally nothing but aggregations of such colleges or grammar schools as they now are, and were intended by their founders to so remain. Not only so; they were also endowed in the interest of the church quite as really as in the interest of learning, and though at present strict denominational schools, they are no more sectarian than they were originally, and were always designed to remain by those who provided their material foundation and the means of their support through all the past centuries of their acknowledged great usefulness. They are not state institutions at all, although having some connection with the state through the appointment and partial support by it of some of their professors, and by the representation of them in Parliament by men of their appointment. And until they become such and are regulated by the state, nay, until the state itself shall cease to be sectarian, there seems to be no good ground for either complaint or surprise that they are managed in the interest of the Church of England. But it is surprising that even the church has not gained wisdom enough to see that the real interests of religion, and the profoundest, broadest, and highest culture of the best minds of the country must, of necessity, perfectly accord, and still more remarkable that the state has not yet been aroused to the fact and the cause of the present inferior rank of England in that highest department of intellectual activity—the philosophical—for which she has demonstrated so remarkable an aptitude by her splendid achievements in the preceding centuries.

As to the qualifications of applicants for admission to the universities, there are none; each college establishes them to suit itself; and there is, therefore, the greatest imaginable variety, from a high competitive standard, intended to exclude all but the most gifted and best qualified, even down to no examination at all; so that young men are not unfrequently admitted at the inferior colleges who are totally ignorant of the rudiments of a liberal education.

The fees to such as are not provided for from foundation funds for poor scholars are much higher than in France, and many times higher than in Italy. They are also marked by this peculiarity, that they vary considerably, according to the rank and condition of the applicant; the matriculation fees ranging between £1 5*s*. and £16, the *caution money* (advance payments) between £10 and £50, and the average unavoidable cost of maintenance being about £60 per annum.

The number of sessions or terms per annum at Cambridge is three; at Oxford, four; of examinations at Cambridge, one; at Oxford, two.

EXAMINATIONS FOR DEGREES.

Examinations for degrees are of two kinds—the easy, general examination for such unambitious slip-shod pupils as satisfy themselves with the ordinary or *pass* degree, and the high-pressure, competitive examination, at the conclusion of the *honor course*, for such as would contend for supremacy in the various "final schools" or departments of learning embraced in the curriculum of the university. The competitive examinations at Cambridge have no parallel in the extravagant length to which they are carried, especially in the school of mathematics, which, as already remarked, is the prominent school in this university. At Oxford, the school of *literæ humaniores*, or classical literature and philosophy, has a corresponding prominence; the schools of mathematics and physical science, of natural science, of medicine, and even of law and history—whose growth has been surprisingly rapid of late years—being entirely subordinate, notwithstanding the fact that with the exception of the last-named and that of natural science, they have long been "honor courses."

Competitive examinations, in themselves, are certainly excellent, and ought to be introduced as a test of qualifications for every important branch of service. But they are liable to prove injurious rather than beneficial if so managed—as is unquestionably the case of the English universities—as to stimulate the selfishness of pupils and encourage them to confine their studies to subjects that bear directly upon the attainment of honors, instead of prompting them to seek the broadest and deepest culture for its own sake.

The examinations are conducted by examiners appointed by the vice-chancellor and proctors, and receive moderate compensation for their services. Hence, too, there seems to be ground for criticism, if the charges made by leading friends of reorganization and the admission

of prominent defenders of the present system in the main may be taken as authority; for it is both claimed and admitted that under the present arrangement the office of examiner is often refused by those who are the most competent and falls into the hands of young men of inferior qualifications. This is especially the case at Oxford, where the examinations—being semi-annual—occupy much time, and where the compensation is, therefore, comparatively less. The competitive examinations are naturally the center around which all else revolves, and yet they are confessedly very imperfect.

The "pass" examinations are no less faulty in that the standard set up is shamefully low. On this point I prefer to quote the testimony of the dean of Christ Church, Oxford, who ought to be good authority, and whose language as recorded in the minutes of evidence taken before the select committee on Mr. Ewart's bill for university extension, (Parliamentary papers, July 31, 1867,) is as follows:

Question. "What is the state of the 'pass' examination at Oxford; does the 'pass' at Oxford require a competent knowledge of classics, mathematics, and physical science, or are any of those subjects omitted?"

Answer. "No; it requires a not very great acquaintance with classics, a very insufficient acquaintance with mathematics, and none with physical science."

Question. "In point of fact, it requires no acquaintance at all with mathematics, as a matter?"

Answer. "Nothing but an examination in the first two books of Euclid, and a certain quantity of arithmetic, I think."

The conditions of residence differ somewhat at Cambridge and Oxford, for while at the former institution students may live in lodgings of their own selection, though subject to the control of their particular college in all other matters, at the latter they are required, without exception, to live in the college or hall where admitted until at the end of three years, when they may select their lodgings outside, being afterward subject to even less restraint than at Cambridge.

The degrees conferred at the English universities are those of bachelor of arts, bachelor of divinity, bachelor of medicine, bachelor of music, bachelor of laws, master of arts, master of surgery, doctor of music, doctor of medicine, doctor of divinity, doctor of civil law, and doctor of laws.

The first, or bachelor's degree, is conferred at the end of a four years' course of study, three and a half of which must have been spent at the university; except in the case of "relations of royalty," members of the peerage, bishops, baronets, and knights, who, at Cambridge, are admitted to the examinations for degrees after seven terms, ($2\frac{1}{3}$ years,) and at Oxford after twelve terms ($2\frac{1}{2}$ years) of study. It is in the examinations for this first degree in the arts that lies the moving force of these two universities, for although the majority of students are satisfied with barely squeezing through and gaining a "pass" degree, there is always a

sufficient number out of the hundreds looking to graduation who are fired with ambition for the glittering *honors* held out to them to induce a most spirited competition.

At Oxford three successive examinations are necessary; the first occurring in the Lent term of the second year's residence, and including, as the more important subjects, one of the four Gospels, or the Acts of the Apostles, in the original Greek, Paley's Evidences, and one of the Greek and one of the Latin classics, the examinations being conducted by moderators and examiners appointed by the university senate. The final examinations are intended to be very thorough, and are really very much more so than in former times. They lead to the four classes of honors—honors in the arts generally, the examinations of candidates for which last twenty-two days; mathematical honors, the examination for which extends over eight days; classical honors, the examination for which lasts five days; and honors in the moral and natural sciences. At the conclusion of the examinations, a considerable number—thirty or more—of those who have most distinguished themselves are recommended by the examiners to the proctors for public approbation, and then divided into three classes, according to merit, to wit: *wranglers, senior optimes,* and *junior optimes,* the members of each classes being named in alphabetical order, and the highest of all in rank being styled the *senior wrangler* for the year. The candidates then take the oath of allegiance, and swear to observe the statutes of the university, after which they are admitted to their degrees by the vice-chancellor, and subsequently to such rewards, in the way of "exhibitions," or stipends and scholarships—of which there are a large number—as they may be adjudged entitled to.

At Cambridge a similar, though more extreme, system of stimulation is in force. The number of examinations is the same, but those who have distinguished themselves are divided into four classes, under the four following divisions: *literæ humaniores, disciplinæ mathematicæ et physicæ, scientiæ naturales,* and *jurisprudentia et historia moderna;* and the members of each of these classes are also arranged in the order of merit, instead of alphabetically, as at Oxford.

The higher degrees above enumerated are conferred more as testimonials of general standing in the departments to which they belong, though the degrees of M. D. and D. C. L. are hedged in by examinations more or less thorough. At Cambridge—and the practice at Oxford is not materially different—the candidate for the degree of D. D. must be a B. D. of five years, or an M. A. of twelve years' standing; the candidate for the degree of D. C. L. must be either a B. C. L. of five, or an M. A. of seven years; and the candidate for the degree of M. D. must be an M. B. of five, or an M. A. of seven years' standing.

ENDOWMENT AND MAINTENANCE.

As aggregations of schools, Cambridge and Oxford are both wealthy institutions, enjoying annual incomes of over $2,000,000 each. But these

large amounts are really the total incomes of the various colleges, derived from ancient endowments and annual fees; whereas the universities, properly and legally so considered, enjoy but very small incomes, scarcely exceeding £6,000 to £8,000 per annum. And inasmuch as the college incomes are confined to the particular colleges for which the endowments were originally granted, and to the particular objects named in the grants, all deficiencies in the revenues of the universities themselves, necessary to the support of professors and to meet other general expenses, require to be, and are, made up by the state, though the amount of parliamentary appropriations for such purposes is never large.

The museums, observatories, botanical gardens, libraries, &c., some of which—particularly the great university libraries, which contain between 200,000 and 300,000 volumes each—are very extensive, are supported by funds derived from endowments specially granted by wealthy friends of education during the long centuries since the date of their origin.

The college foundations at Oxford are sufficient for the support of nearly six hundred fellows, and those of Cambridge are scarcely less productive, the average income of fellows being something over £230, while heads of houses receive £1,000 and over.

The number of students at Oxford is usually twelve hundred to fourteen hundred; at Cambridge, about fifteen hundred.

The other British universities are: London University, the University of Durham, Edinburgh University, St. Andrew's University, Aberdeen-Glasgow University, and Anderson University at Glasgow, and Queen's and St. Stephen's Universities, at Dublin.

UNIVERSITY OF LONDON.

The University of London, established at the instance of Lord Brougham and other liberal friends of reform in education, in the year 1836, has for its object the promotion of sound learning without regard to rank, sect, or party. It provides no instruction whatever, but, by authority of Parliament, sits in judgment upon the qualifications for honors of all who present themselves as candidates for either the literary or professional degrees. It is, in fact, a board of examiners of government appointment, and nothing else. The broad principle on which it rests was calculated to command the respect of the great English public, and its duties have been so ably and impartially performed that it has come to be an extra honor to have passed its ordeals; so that it is not uncommon now for graduates of Oxford and Cambridge to undergo its examinations also.

Durham University is of recent origin, (1833,) and has not attained to much importance. Instruction is pretty much confined to the liberal arts and theology.

UNIVERSITIES IN SCOTLAND.

Edinburgh, now nearly three hundred years old, has long been distinguished among the British universities. It includes the four faculties of arts, medicine, law, and theology, with power to confer the ordinary degrees. It possesses a valuable library of 100,000 volumes, and which is constantly increased in extent by means of an annual grant of £575 from the government, by the £1 fees paid for it by each matriculant, the £5 contribution made by every new professor, and a percentage on the graduation fees in the arts and in medicine. It has likewise an extensive museum, rich in objects illustrative of natural history.

Under an act of Parliament passed in 1858, a board of commissioners appointed by the Queen has had in progress a revision of the statutes regulating the matter of foundations, the election of university officers, and the courses of study; and the result has been an infusion of new life into what had become a rather dull and lax institution, doing even less than the English universities to advance the cause of thorough and profound culture. Touching this subject, Professor Blakie, of Edinburgh, is quoted by Dr. Döllinger, of Munich, as saying: "Scotland, at the present moment, is in no sense of the word a learned country; especially at our universities learning is at the lowest possible ebb."

A large proportion of the professors (thirty-two in number) are appointed by the corporation of the city, and others are appointed by the Crown.

The term of study requisite to admission to the examinations for degrees is four years; the number of terms per annum two, the first commencing November 1 and ending April 30, and the summer session commencing the first Monday in May and ending with June.

The students visit the university simply for the purpose of instruction, and board wherever they like. The number in attendance is usually about fifteen hundred. The foundations for the support of students are of trifling importance, the total annual income therefrom amounting to but little more than £1,000; which amount is shared by some eighty students.

Examinations for the degree in arts are chiefly occupied with Latin and Greek, mathematics, rhetoric, natural and moral philosophy. The regulations governing the granting of degrees in the professional departments have been already considered under appropriate heads.

St. Andrew's University at St. Andrew's, though the oldest university of Scotland, has never attained to great importance. It consists, in fact, of two or three literary colleges and a divinity college, and may be ranked in the same category with Durham.

Aberdeen University is, likewise, simply an institution of this same general character, minus the college of divinity.

The University of Glasgow, founded 1451 under a bull of Pope Nicholas V, is a flourishing institution and possesses some peculiarities worthy of special mention. The academic course extends over four

years, but there is only one session annually, which commences on the last Wednesday of October and closes May 1. Students applying for admission are expected to have mastered the Latin beforehand, and are required after entering, whatever else they do, to give particular attention to Greek during the first year, to logic the second, to moral philosophy the third, and to natural philosophy the fourth year.

The number of students in annual attendance is about one thousand, all of whom are day pupils, boarding where they choose. The only aid granted to pupils consists of sixty bursaries, varying in amount from £5 to £50 per annum, and tenable for four to six years according to circumstances.

The academic body consists of the lord chancellor, the lord rector, the vice-chancellor, the dean of faculty, and some twenty-five professors.

The library contains over sixty thousand volumes, and the anatomical collection, bequeathed by the distinguished Dr. William Hunter, is one of the finest in Europe, being valued at nearly three-quarters of a million of dollars.

The Anderson University, so called in honor of its founder, Dr. Anderson, professor of natural philosophy in the University of Glasgow, originated in a desire to make provision for the instruction of the working classes of the city in the mathematical, physical, and natural sciences, as well as in literature and the arts, and even in medicine. It enlisted the sympathies of many of the ablest professors, lecturers, and teachers of Glasgow, and early met with extraordinary success; the number of pupils in attendance having, in some years, equaled seventeen hundred.

QUEEN'S UNIVERSITY, DUBLIN.

Queen's University, the chief university of Ireland, is an anomalous institution, embracing the colleges of Cork, Galway, and Belfast, and holding its senate in Dublin Castle. It is a sort of University of London, therefore, but restricted in its jurisdiction to the colleges named, instead of opening its examinations to, and conferring its honors upon, the pupils of fifty or more colleges, as does the London University board. Its three branches report an aggregate of nearly one thousand students. The annual grants to the colleges themselves amount to about £26,000; to the central, or university organization, some £3,000.

SPANISH AND PORTUGUESE UNIVERSITIES.

The present universities of Spain require but little attention, as, in common with every other department of education, and with the industrial, civil, and political institutions of the country, they have long been in a half-decaying and almost dormant condition. Theoretically, there are ten of them; but in reality there are but six that seem entitled to the name, to wit, those of Madrid, Salamanca, Seville, Saragossa, Valencia, and Valladolid; and even these are less than universities in the

strict sense, or even as compared with the best French or Italian examples. They are formed much after the Italian model, but, almost without exception, are incomplete in the number and constitution of their faculties, and are deemed by progressive statesmen and scholars the chief bulwark of effete political institutions. Their funds have been squandered by civil war, and many of their buildings are in ruins.

The one at Salamanca, as already mentioned in Chapter I, was established in the thirteenth century, and from about the middle of the fourteenth was long a rival of those at Paris and Bologna, having no less than twelve thousand students; but at present its condition is less prosperous than that of any of the other six above named, the faculties being badly organized and the number of students scarcely more than three hundred.

The universities of Seville, Saragossa, and Valladolid, also ancient, are in a much better condition and are better attended; the first claiming one thousand students and being provided with very valuable museums of geology and mineralogy, chemical and physical laboratories, a library of some sixty thousand volumes, and with rich collections of sculptures and pictures. Unlike the University of Salamanca, where they are largely subordinate to the humanities, the University of Seville shows a sort of French partiality for the mathematical, physical, and natural sciences. This same is also true, to a great extent, of those of Saragossa, the number of whose pupils is over one thousand, of Valladolid, which numbers over thirteen hundred, and of Valencia, which claims fifteen hundred.

The University of Madrid was formerly located at Alcala, from which place it was removed as late as 1836. Its curriculum of study up to that date had been so narrowly limited to the *literæ humaniores* that the creation of chairs of natural history, astronomy, and medicine, at the date of re-establishment, was a very important event in its history.

In Spain, as in Italy and France, theology is so widely and preferably taught in the theological seminaries that it receives but little attention, in the way of systematic teaching, in the universities.

Engineering, navigation, commerce, architecture, and art, so far as they are taught at all—and some of them are quite thoroughly taught—are provided for in special schools and have no place in the universities, which are, therefore, pretty much confined to the humanities and to law and medicine, although such of them as claim to be full universities embrace the five faculties found in those of Italy and France.

The total number of students in annual attendance is not far from eight thousand, or one to every two thousand inhabitants.

Portugal has had but one university from the beginning, the Royal University at Coimbra. This institution was founded in 1290 at Lisbon, but removed eighteen years afterward to its present seat, where it has continued to flourish without interruption ever since. It embraces eighteen colleges like those of Cambridge and Oxford, but likewise

includes quite complete university courses arranged in six faculties, equivalent to faculties of letters and philosophy, of mathematical and physical science, of natural science, and of law, medicine, and theology.

The courses of study extend through periods of four to six years, and the examinations are said to be unusually thorough. The number of professors is forty-eight; of teachers of lower rank, forty; of pupils, one to two thousand.

GERMAN UNIVERSITIES.

Under this head I shall include the universities of all those countries in which the German mind is the controlling power, and in which the institutions are, therefore, mainly of the German type, viz: those of Austria, first in chronological order; Prussia, with its several provinces; the recently acquired duchies of Hesse-Cassel and Schleswig-Holstein, and the kingdom of Hanover, Saxony, Bavaria, Wurtemberg, Baden, Hesse-Darmstadt, Saxe-Weimar, and Mecklenburg-Schwerin.

The total number of universities embraced is 27; of which 8 belong to Austria, 9 to Prussia, 1 to Saxony, 3 to Bavaria, 1 to Wurtemberg, 2 to Baden, 1 to Hesse-Darmstadt, 1 to Saxe-Weimar, and 1 to Mecklenburg-Schwerin. They all agree in certain general characteristics, among which are predominant, motive, mode of maintenance, official organization, administrative regulations, number and constitution of faculties, general terms of admission, term of study, and character of degrees conferred.

It is in the German university, as nowhere else, that the leading object is science—not science in the popular but in the highest and most comprehensive sense, as standing for the profoundest and most exhaustive knowledge of every branch of human learning. Science is primary; profession is secondary. This is the rule, and if any of the universities fail to be governed by it they fail in just so far from reaching the ideal standard. For the realization of this ideal the state and the learned class co-operate with harmony and singleness of purpose, while the great middle class of the people, proud of the noble institutions thus sustained and directed, second that purpose, and give to the universities all needed practical support. And, accordingly, more than any others of Europe, they present that rare compromise between the largest liberty and the most complete state control, which, when properly adjusted and harmonized, are so well calculated to yield the most satisfactory results.

The institutions were originally founded by the government, and the statutes, organization, and instructional force are of its creation. Moreover, the state makes provision from its own treasury for all deficiencies in their incomes from property and fees, which, in most cases, are small in amount, and constitute but a small part of the total cost of maintenance. And yet, within liberal constitutional limitations, the university authorities are practically the managers of all their internal affairs, with but little or no interference from the state, whose object is simply to make sure that the great purposes for which the institutions were established are faithfully carried out.

ORGANIZATION AND GOVERNMENT.

The minister of public instruction, or some other delegated agent of the sovereign, where such ministry does not exist, is the immediate source of all authority; the legislative department and the sovereign are the ultimate source. Subordinate to, and appointed by, the minister are the curator, whose duty it is to represent the government by the enforcement of the laws and regulations which govern the universities; the professors; and the quæstor, an officer of inferior rank, charged with the duty of collecting all fees due from students to the professors, and of paying over the same, retaining a small percentage for his salary and for the treasury of the university.

The other officers are a rector, (usually styled *rector magnificus*,) a pro-rector, a judge, (*Universitäts-Richter*,) in some cases a chancellor, (*Kanzler*,) and deans of faculty, all of whom are chosen by the full professors for the term of one year only, though the same person is eligible to a re-election.

The rector, as in France, Italy, and many other countries, is the visible head of the university, his office corresponding in powers and duties to those of vice-chancellor in England, and of president in the United States. Whenever it becomes necessary for him to act in a judicial capacity upon questions involving an infraction of rules, or when other persons than members of the university are called before him, he has the *Universitäts-Richter* to act with him in deciding the case.

The pro-rector, except in Austria, where he is a sort of lieutenant to the rector, is found in the German universities only in cases where, as at Halle and Jena, the sovereign is the nominal rector, in which event the pro-rector is *de facto* rector.

The dean (*Dekan*) is chosen annually by the professors of the faculty to which he belongs, and of which he acts as presiding officer at all meetings and in the decision of all questions belonging to faculty jurisdiction. In some institutions there are also *Pro-Dekane*, or vice-deans, and, besides these, directors, in more immediate charge of the practical affairs of the several faculties.

The legislative body and, at the same time, executive council of the German university is the senate, (*senatus academicus*,) composed of the rector, (or pro-rector, or both, where both exist,) the out-going rector, the *Universitäts Richter*, the deans of the four faculties, and four or five from the number of ordinary professors, chosen by their fellows. In some cases, as at Leipsic, four or five professors, in addition to those above referred to, are made a part of the senate by appointment of the minister; and in still other instances the secretary, the *Kanzler*, and other officers are likewise members *ex officiis*. In many universities this is the only deliberative body, but in others, as in that of Leipsic, there are, besides this, a larger senate, including, besides the general officers, the whole body of ordinary or full professors, (known at Leipsic as *das Plenum der ordentlichen Professoren oder der weitere akademische Senat*, and at Halle

as *das Generalconcil,*) and a university assembly, (*Universitäts Versammlung,*) which also includes honorary and extraordinary professors.

The university court is an institution peculiar to the universities of Germany and two or three other countries, to which they have served as models, and constitutes very interesting evidence of the high esteem in which they have always been held by the state, and of the large amount of liberty they enjoy.

For ordinary cases the court consists of the rector and university judge, but for the trial of grave offenses a number of professors are added. The constitution and jurisdiction of the court differ somewhat for the various universities, but in the main the resemblance is so close that a single example will serve as an illustration of all.

At Göttingen, for instance, the jurisdiction of the university includes:

1. The officers and professors, assistant professors and private lecturers, connected with the university.

2. The students of Göttingen University.

3. The governors or private tutors of the university students.

4. All students of other universities so long as they reside at Göttingen.

5. The wives of all the above persons, and their children during the life of the father.

6. Even after the death of the father the widows and children of the following:

Of ordinary and extraordinary professors.

Of the officers of the court of the university, including the clerk.

Of the officers of the library, including the secretaries.

The cases embraced within the jurisdiction of the university court belong to the following classes: 1. Discipline. 2. Offenses ordinarily belonging to the jurisdiction of the police. 3. Common civil process and collections as defined by law. 4. Voluntary judicial proceedings.

Acts of students against police regulations are to be treated as acts against discipline only.

To give efficiency and practical value to these prerogatives of the court, the university charter provides that the administration of the police in the city of Göttingen shall be divided between the magistrate of the city and the officers of the university. The university has its own police officers, therefore, who are strictly under the direction of the academical authorities. Students committing any offense may be arrested, in very urgent cases, by the city police; but they must be forthwith delivered over to the academical officers. And so, on the other hand, citizens of Göttingen may be arrested by the university police, but they must be immediately surrendered to the proper city authorities.

In case of riots or other serious disturbances of the peace, both classes of police act in concert for their suppression and the arrest of the offending parties.

All more important offenses, such as would be punished by more than three day's imprisonment, are tried by a court tribunal, consisting of

five regular or full professors, including at least three jurists, all of whom are chosen by the whole body of ordinary professors at a meeting held for that purpose.

Thus the German university is a sort of little republic, with its legislative, executive, and judicial departments, and maintaining under its constitution a quite independent existence. Not only so, like the universities of Oxford and Cambridge, it has, in some cases, the constitutional right—a right long enjoyed by Göttingen—to a representative in the national legislature, its representative being chosen by the ordinary professors. The franking privilege, within very generous limitations, is still another immunity very commonly enjoyed, and one which contributes very greatly to an interchange of valuable correspondence and exchange of printed matter between all the universities of the German States.

FACULTIES AND INSTRUCTORS.

The standard number of faculties embraced in the German university is four; the Royal Bavarian University at Munich, which adds a faculty of political economy, (*staatswirthschaftliche Facultät*,) and the Royal Wurtemberg University at Tübingen, which possesses both a Catholic and an Evangelical faculty of theology, and to its philosophical faculty adds a faculty of political economy, and another of natural science, (*naturwissenschaftliche Facultät*,) constituting the only important exceptions.

The regular faculties are those of theology, (Protestant or Catholic, according as the one or the other is the dominant religion of the country,) of law, of medicine, and of philosophy; the last-named comprising not only philosophy distinctively considered, but likewise language and literature, together with the mathematical, physical, and natural sciences; in short, the whole range of knowledge as considered independent of the professions. Each faculty, through its ordinary professors, headed by a dean, regulates its own internal affairs, subject to the statutes of the university, the senate, and the administrative head, looking to the enforcement of all regulations among its own members, straightening up all delinquencies, and, if necessary, handing over offenders to the superior authorities for punishment.

As an instructional force, the faculty consists of all persons who have authority to teach in the department of learning in whose interest it was organized, to wit: ordinary or full professors, (*professores ordinarii* or *ordentliche Professoren*;) extraordinary professors, (*ausserordentliche Professoren*,) sometimes also known as *Adjuncten*; private lecturers, (*Privatdocenten*;) instructors, (*Lehrer*;) and assistants, (*Assistenten*.) In most institutions the first three classes constitute the entire body of instructors; the fourth and fifth classes being peculiar to Austria.

The ordinary professors of Germany correspond to the *professeurs titulaires* of France. They are named by the minister, or by the sovereign,

and are partly, in some institntions wholly, appointed by the state. Each one is assigned to a special hranch of stndy belonging to his faculty, upon which he is bound to give at least two public lectnres weekly, free of charge, to students. Lectures not thns free are termed private, and the professor may give as many of them as circumstances will permit. The average number, however, is hetween fonr and five a week; the ordinary duration of each lecture, except in the case of chemical or other demonstrative lectures, being one hour. The number of ordinary professors in each university and facnlty is nsually limited, yet the state may, if it chooses, name a distinguished man as professor in any facnlty though it be full, paying him the regular professor's salary, a thing which has several times been done as a special reward for high merit. The salary received by the ordinary professor being derived partly from the state and partly from examination and tuition fees, is not an unvarying amount, though it sometimes rises to a very handsome figure. The amount derived from the state is alone fixed. This, however, varies materially for different institutions, according to their resources and to the wealth of the state. In some instances it is as high as $2,000 per annum. The portion derived from examination fees depends, of course, largely upon the popularity of the faculty as a whole, and at snch numeronsly attended universities as those of Berlin, Vienna, Bonn, Munich, Heidelberg, Göttingen, and some others, amonnts to a considerable snm, while in others it is very small. But the fees derived from pay lectures are determined in amount by the popularity of the professor himself. And here is one secret of the great activity shown by nearly all, and the remarkable genins and power developed hy many. So far as money can be made an incentive to action, they have the benefit of that incentive. Under this threefold arrangement I have not been surprised to find the incomes of many German professors amonnting to from $5,000 to $8,000 per annum, the equivalent of at least $10,000 in this country.

The limit to the number of ordinary professors, the high qnalifications of which the possession of the office is a sure guarantee, (since no one can receive the appointment of full professor unless possessed of the doctorate in the faculty to which appointed, nor then unless known to have marked ability in his department,) and the fact that to the man of genins and ambition the professorship is a very sure door to both fortune and fame, all these circumstances, with many others, cause the professor's chair to be very eagerly songht. It is, in fact, the high prize offered hy the career of public instruction.

The extraordinary professor of the German university is the *professeur suppléant* of the French faculty. His real position is that of an assistant to the corps of regular professors. He does not in all cases, as they do, receive a fixed salary from the state, but is obliged to look to such fees as he can command hy his ability as a lecturer. If essentially wanting, the students will very soon find it out and bestow their time and fees

upon some abler and more zealous professor. The extraordinary professors also have their appointment from the state, and are first in the line of promotion. They are taken from among the most distinguished of the next lower class, and not unfrequently, in ability and popularity, surpass their superiors in rank.

The *Privat-docenten*, though likewise found in Italy, and in the Scandinavian States, in just the character and importance of the office they fulfill, are peculiar to the German university. As their title indicates, they are private teachers, but in a very different sense from that in which the term private teacher is understood in this country. Nor does the title in any proper sense correspond to the English idea of tutor, which is that of a young man of moderate abilities and often more moderate attainments, pursuing the deadening, hum-drum routine of instruction in the college. They do in some cases perform the office of private tutor, giving lessons to individual students, which lessons then have the title of *privatissima*, but these are incidental and exceptional labors. Their chief work consists in giving lectures upon such branches of knowledge, embraced within the range of the faculty to which they belong, as they prefer to investigate and discuss. Practically, they differ in rank and privileges from the extraordinary professors in no respect, except that they are one step lower in the way of promotion, and are entirely dependent upon fees for their compensation. The lecture-rooms of the university are freely open to them when not occupied by the professors, and their lectures count just the same for those students who attend them. The regulation of the fees charged for lectures by the *Privat-docenten* is entirely with themselves, except that no one is permitted to charge a less fee for a given course of lectures than is the standard fee of the full professor for a like course.

The source of the authority of the *Privat-docenten* is also the minister, but the faculty must first approve of his occupying the place to which he aspires, and he must undergo an examination (entitled *Habilitation*) conducted by two professors therein, formally delegated by the whole faculty for the performance of that duty. None but a student or scholar of acknowledged ability and distinction, as a rule, will venture to offer himself as a candidate. Having done so, produced the requisite certificates of study, &c., and creditably passed through his *Habilitation*, he is nominated to the minister, upon whose confirmation—a matter of course in nearly all cases—the candidate is named a *Privat-docent*, and declared to be entitled to all the privileges of that office.

With such freedom as to the subject of lectures—a freedom so entire that the *Docent* is not unfrequently found, upon the same day and in the same lecture-room, delivering a lecture upon precisely the same subject as that discussed at another hour by a full professor—it will readily appear how great must be the activity of life and labor among the teachers at the German universities. Indeed, without a personal acquaintance with those institutions, and a just appreciation of how

remarkably personal ambition is subordinated to a pure and noble love of science, one finds difficulty in crediting their almost entire freedom from those jealousies and ungenerous rivalries which otherwise might be expected to have place in the midst of so much active competition. Here, also, and in the freedom of opinion enjoyed by all, one finds the secret of that extensive and profound scholarship by which German university professors are characterized, and of that scientific and progressive spirit which has given to the educational institutions of Germany a position in advance of those of all the other nations of the world. The governments of Germany are reckoned among the despotisms; yet there is no country on the globe in which intellectual liberty is so highly valued or so fully guaranteed by the sentiment and will of the great body of the people. The universities are the stronghold of this liberty. The professors, as before remarked, are of royal appointment, but removals for opinion's sake are nevertheless rarer there than even in America. At the great University of Berlin, under the very shadow of the royal palace, it is not at all uncommon to hear republicanism sanctioned and even eulogized at the expense of monarchism, and the bold professor is rarely interfered with, even to the extent of a gentle remonstrance from the sovereign or his minister. Genius, though by no means rarer, is more precious in Germany than in most other countries; and there is scarcely anything that a German sovereign will not submit to rather than the extinguishment of one of its intellectual stars from the university constellation.

The number of professors, actual and relative, of the two classes and of *Privatdocenten*, is as various as the number of institutions and faculties. In the countries heretofore considered, there has been found a great predominance in most cases of ordinary or regular professors; but in the German States we find the exact reverse of this, the number of extraordinary professors and of *Privat-docenten* largely preponderating in nearly every case, and in many more than doubling that of the ordinary professors. And it is worthy of remark that this very disproportion exists to a greater or less degree according as the university is more or less alive and prosperous. The same remark also applies equally to the faculties individually considered. The proportion of extraordinary professors and of *Docenten* is invariably greater in that faculty of a university whose prominence is greatest. Thus the relative number of these extra teachers is greatest at the universities of Berlin, Vienna, Leipsic, Munich, Göttingen, and Heidelberg, which are among the most prosperous and numerously attended of the German universities. Again, at Berlin the philosophical faculty is the great faculty, while at Vienna medicine is dominant; and it is in these particular faculties that we find much the larger proportion of extra teachers. And the same is true of many other institutions that I will not stop to name, all of which afford examples of "a rule that works both ways." The prominence given at any university to a given faculty constitutes it a

magnet, with attractive power for such as are partial to the department of learning by it represented; and the gathering of these about it as a center, in turn, tends still further to increase the prominence and popularity of such faculty.

The total number of professors and teachers in the German universities at the present time is over 2,200. A recent French reporter, (M. Minssen, sent out by Minister Duruy in 1866,) who, however, gives the whole number of complete universities as 23, whereas it is really 27, makes the number 2,031; of which total, the number assigned to faculties of theology is 238, to faculties of law 275, to faculties of medicine 520, to the philosophical faculties 786, and to the faculties of political economy 20. The lowest number belonging to a single university is 35; the highest, (at the University of Berlin,) 190.

The university year in Germany is divided into two semesters, known as the winter-semester and the summer-semester. The winter-semester generally begins about the first or middle of October, and closes about the first or middle of March; the summer-semester begins about the 1st of May, and ends about the 1st or 15th of August; so that the number of lectures or lessons by each professor doing full work averages nearly or quite one hundred.

There are no fixed courses of instruction in the German faculties, such as we have in the collegiate institutions of this country, and as are common in the faculties of Italy and some other countries; and yet the studies are not without some systematic arrangement; for, although so many of the lecturers give courses on such subjects as suit themselves, their lectures are so co-ordered and timed by the dean, to whom each one reports the subject of the course he proposes to give, that the student aiming at a degree is enabled to pursue his studies in logical order.

Of the kind and quality of the instruction I deem it necessary to say but little. No class of teachers have so high a reputation for thorough and exhaustive teaching as the German; and after recent comparisons of German university professors with those of nearly all other countries, I am able to confirm this estimate. The enviable position held by them is referable to several causes, prominent among which are, the philosophical, patient, and laborious character of the German mind; that long-cultivated and now natural love of research and profound learning, by reason of which there is among them a universal contempt for, and intolerance of, every species of superficialness and pretense; the consequent high estimate put upon learning by both people and government; and, as further consequences, that liberal endowment and support of the universities which allows of the necessary division of labor, with suitable rewards for service, and that fine *esprit de corps* which, as in no other country, here characterizes the teacher's profession.

It may still be considered an open question whether the universities of Germany do well to confine their instruction so exclusively to *lectures;*

but considering, as of course they do, that question settled in the affirmative, it is difficult to point out particulars in which the character of their work could be very materially improved. If, like our own and the British so-called universities, they were designed for elementary instruction, then it would seem that in some instances their courses of instruction were almost too exhaustive for the limited period of study adopted, which—except in the medical faculties of Austria where the term is one year longer—do not exceed four years; for in such event it is evident that the mind of the student would be too much burdened with details. But it must not be forgotten that such is not the design of the universities of Germany. Elementary instruction belongs to the gymnasia, which perform their office so thoroughly and well, as I have endeavored to show in Chapter IV, that the universities are enabled to confine their labors pretty much to the higher office of inducting their pupils, already very well disciplined and generally informed, into the matter and methods of philosophy and original investigation. And, accordingly, if at Berlin one, two, or even three theological professors and *Privat-docenten* choose to devote five lectures each per week for a full half-year to symbolical theology, or the book of Isaiah; or if in the philosophical faculty an equal number of learned professors should devote an equal time to the *Nibelungen*, to the *Sacontala* of Calidâsa, to the limits between poetry and philosophy, or to the *Bhagvatgita;* or if a Viennese medical professor or *Docent* should take it into his head to give one hundred lectures on eye-glasses, they will none of them find difficulty in securing an appreciative auditory. The eager, philosophic mind of Germany demands exhaustive discussions of every sort of subject worthy of investigation, and it is one important object, if not the leading object, of the universities to furnish them.

ADMISSION TO GERMAN UNIVERSITIES.

The regulations which govern the admission to and connection with the German university are also matters of special interest. Up to 1788 nothing more was required for admission than a letter of recommendation from the school of the applicant's former attendance and the approval of the dean of faculty after a superficial examination to test his knowledge of Latin. But this laxity led to very bad results in the way of filling the universities with ignorant and worthless students; and, accordingly, in that year an edict was promulgated requiring that the public schools should examine their pupils before allowing them to proceed to the university, and that the university authorities should themselves examine all pupils coming from private schools. But in those days the universities were so much more strongly influenced by a desire for numbers than for high scholarship that the examinations instituted by them were often so far inferior to those held by the public schools that it became a not uncommon thing for boys to leave the public schools before the date of examination and enter private schools, in order that

their examination might be by the university authorities. Accordingly, in 1794 the *allgemeine Landrecht* provided that the admission examination held at the universities of Prussia should be by a *commission*. Still as there was no prescription of just what the examination should be, there was no uniformity, and other modifications of the plan became necessary. The first amendment, carried through the influence of that noble and intelligent friend of a higher university education, William von Humboldt, was a uniform examination obligatory upon all candidates, without regard to the place or circumstances of their preparatory training. But the details of this modified plan were still faulty, in that they provided for three grades of certificates to be issued to those who were to be examined; certificate No. 1 declaring the holder to be thoroughly qualified for the university, No. 2 that the possessor was partially qualified, and No. 3 that the candidate was found to be unfit for admission. This did not remedy the difficulty, for with the growing desire for students that followed upon the restoration of peace, in 1815, the universities lowered the standard of qualifications so as to receive the holders of second-grade, and finally of even third-grade, certificates. And so at last the government of Prussia adopted the method early suggested and urged by Schleiermacher, when a member of the council of education—that of confining the examination to the gymnasia, whose interest was not to crowd ill-prepared boys into the universities, but to send them only such pupils as would do honor to the school where prepared for the higher courses of study.

This examination is now known throughout the Germanic States as the *Abiturienten-Examen*, (the leaving-off examination,) and the certificate as the *Maturitätszeugniss*, (certificate of ripeness.) The examining board comprises the director of the gymnasium and the professors who teach in the highest class, (*prima*,) a representative of the *Schul-Curatoriums*, or board of curators, where the gymnasium has such a board of supervision, the joint patronage commissary of the Crown, and a member or delegate of the *Provincial Schul-Collegiums*, or school board of the province; the last-named being always president of the commission. The examination is a very thorough one, and there is now no other door of admission to any of the faculties in any university. To guard against *cramming*, it is required that the candidate shall have spent his two full years in class *prima*, thus making sure that he has had fair opportunity for that thorough discipline and those solid attainments for which the German gymnasia are so justly noted; and the examination being, in the first place, upon such subjects as constitute the regular staple of class labor, is made to consist largely of paper work, (essays, &c.,) upon themes chiefly selected by the president of the examining commission. The general subjects embraced are German language, Latin, Greek, French, mathematics, physics, geography, history, and religion; and if the candidate proposes to enter any of the faculties of theology he is also examined in Hebrew. The examination papers are prepared by the director and pro-

fessors of the gymnasium, several sets being made ready, and the president of the board choosing from them. The paper work usually occupies a full week, and the *viva voce* examinations are participated in by all the members of the commission. The terms used, and the only ones, to designate the character of each performance are "excellent," "good," "sufficient," "insufficient." A mastery of the mother tongue, thoroughness in Latin, and extra-good standing, either in classics or mathematics, even though in the other branches he should be a little deficient, will secure him the approval of the board and the designation of *reif*, (ripe;) but upon the branches named there is no such thing as compromise.

Each member of the board of examination signs the certificate, which relates to conduct as well as attainments, and the delivery takes place at the end of the semester, an occasion of great public solemnity—on commencement day.

Should a candidate fail to pass, and so receive the designation in the report of the commission of *unreif*, (unripe,) he is recommended either to remain another half-year at the gymnasium and then submit to a second examination or to abandon at once all idea of entering the university. Should he refuse the advice of the board and apply at the university for admission it will avail but little; for without one certificate or the other he cannot be received at all, and with the certificate of *unreif* only in the faculty of philosophy; nor even there as a university matriculant, but simply as an auditor, entered in a special register, and getting no credit for time thus spent, should he conclude to retrace his steps to the gymnasium, and, through a second and last examination, finally gain the certificate of maturity.

Persons not members of any public school may make their way into the university, but they can only do so through the door of the gymnasium. The steps to be taken are these: The candidate first makes application to the *Provincial Schul-Collegium* for leave to attend the certificate examination of some gymnasium; presenting to the board, with his application, satisfactory testimonials as to study, moral character, &c., and a statement, in good German, written by himself, of his previous course in life. If approved by the board they send him to some convenient gymnasium for examination. In the event of failure to pass, the board of examiners are at liberty to name a time after which he may try again and for the last time. At such examinations some allowance is made for the circumstance of his being examined by a board of entire strangers; but to prevent advantage being taken of this, as well as to prevent a desertion of public-school pupils in class *prima* for private schools, so as to come in for examination short of the expiration of the full period of study, the law carefully provides that no one thus conducting himself can apply for the requisite examination within the two years of *prima* without special permission from the minister of public instruction.

Such are the regulations which in Prussia guard the door of entrance to the university; and, with but slight modifications, these are the regulations throughout Germany; and when it is remembered that the total of qualifications for the *Abiturienten-Examen* at the close of the gymnasial course is quite up to those demanded at our best collegiate institutions in America, and very much higher than those demanded by many of our so-called universities for the degree of bachelor of arts, we shall then be able to comprehend the difference between the highest German institutions and our own, and to get some idea of how intelligently the governments and people of these states unite their best efforts to advance the national culture and to save the learned professions and the civil service from candidates unworthy of the grave responsibilities involved.

Thus prepared with the evidence of his fitness to begin the study of science, letters, and philosophy, the ambitious student presents himself at the university of his choice, pays the matriculation fee of \$4 to \$5, signs an agreement to observe all the statutes and rules, and is enrolled on the general register as a member of the university, after which he may register in the faculty of his choice.

The lecture fees vary a little in amount in the different faculties; the highest being, as a rule, in the medical department, and the range being between \$2 and \$5 per semester. In some universities, as at Leipsic, for example, all public lectures are free, and in all there are either subsidies derived from endowment funds for the support of poor students, or provision by statute that such students as are unable to pay the very small fees demanded shall, nevertheless, be permitted to attend the lectures, afterward paying the total of fees out of their incomes when established in their profession. In Prussia, each university has a considerable number of subsidies, bursaries, or exhibitions, as they are variously called in different countries, for the benefit of poor students, amounting to sums varying from \$60 to \$300 per annum.

I have said that the term of study in the universities is commonly four years, that in the medical faculty of some being five years; but I have not yet stated what constitutes an important peculiarity of these institutions, viz: that no student is permitted to take a purely and exclusively *professional* course. He must give some time to the philosophical studies necessary to a broader and deeper culture. This rule, though in letter somewhat different in the different universities, is substantially the same in all. Thus at Munich, and in all the Bavarian universities, it is required by statute that each student shall devote at least one year to the studies embraced in the philosophical faculty; it being optional with him whether he will make the first year entirely philosophical, or carry his philosophical studies through the first two years, distributing his labors in that general field equally over that entire period, and pursuing them simultaneously with his professional course. In any event, it is obligatory upon every student preparing for a profes-

sional career that he shall attend at least eight regular courses (a regular course is one that occupies from four to six hours per week throughout the entire half-year) of lectures during the first two years of university attendance; it being strongly recommended that said eight courses shall include especially philosophy, philology, history, mathematics, physics, and natural history, and that carful attention be given, at the same time, to the historical development of these several departments of learning. To insure obedience to this regulation, the several faculties are forbidden to admit to examination for the degree any native student unless he can prove that he has fully complied with it.

It is also a peculiarity of the German universities that students are permitted to visit other universities during their four years' course, without loss of time in the final count. With the permission of the government they may also have the time counted that is spent in approved foreign universities.

Thus far I have spoken only of the regular courses. Concerning the extra courses—those given by extraordinary professors and *Privat-docenten*—it is sufficient, in this connection, to say that the fees demanded for them range between $3 and $14, according to the nature of the subject and ability of the lecturer; that in the final reckoning these lectures count the same as those termed regular; and that the delivery of a proposed course is compulsory upon the lecturer when a given number (usually ten or twelve) of students have subscribed; provided the subscribers demand it. All fees, whether for regular or extra lectures, are payable, in advance, to the quæstor.

Examinations, as a test of progress and proficiency, during the period of attendance are less frequent, except in those of Austria, than in the universities of almost any other country; the assumption being that young men, who have ripened for the university under the thorough discipline of the gymnasium, passed the trying ordeal of the *Abiturienten-Examen*, gaining with so much hard labor the *Maturitätszeugniss* requisite to entrance upon the higher course of the university, and for whom, under the regulations governing the degree-examination, there can be no honorable exit without a mastery of the prescribed courses of study, should be superior to the restraints, petty stimulations, and compulsions commonly employed in the public schools.

In fine, so far as students are concerned, the distinguishing feature of the German universities is the large amount of liberty they enjoy in harmony with the demand for large results. They lodge and board where they like, attend lectures when and where they prefer to—even though it should be at a neighboring university, more prominent and popular in a particular department than their own—and socially enjoy nearly as much liberty as the ordinary citizen; being only amenable to laws the enforcement of which is exclusively with the rector of the university and the university court, and the penalties for the violation of which are reprimands, fines, imprisonment in the university *Carcer* for

a period not exceeding one month, dismissal from the particular university attended, but with liberty to enter another, and absolute expulsion, (*Relegation*,)notice of which to the other universities is a positive bar to admission to any one of them.

Whether the liberty thus accorded to German students is better, all in all, than the system of restraints and artificial stimulants carried to such absurd extremes in some other countries, can hardly be a question with any unprejudiced observer who has carefully studied the practical workings of the two methods. As for myself, although the German universities have seemed so far superior to all others that I find myself loth to qualify the high praise I have felt bound to bestow, the conviction has nevertheless fastened itself in my mind that an occasional or even frequent questioning of students by the professors upon the subject-matter of previous lectures, and the adoption of some judicious method of strengthening and elevating the moral influence of the universities and the whole body of their pupils, would render them still more eminently successful in promoting the highest national culture. For, notwithstanding the students have necessarily received much intellectual discipline at the gymnasia; and have been pretty well established in studious habits during their long course of thorough training there, and have, moreover, been systematically drilled in the dogmatics of religion, they are, in general, only youths when they enter the university, and not unfrequently prove themselves not to have been sufficiently well-grounded in the best intellectual habits and in the principles of a true manly virtue to warrant the very abrupt transition they undergo in passing from the drill and restraint of the public school to the almost absolute freedom of the university. Certain it is that there is much idleness and fast living among German students of the less ambitious and more independent classes, and much less respect for things in the highest and best sense spiritual than is essential to their own individual well-being or the earliest realization by the nation of a true Christian civilization. The rioting, drunkenness, gambling, dueling, and other flagrant outrages upon individual and university honor and upon the peace of neighborhoods, so shamefully frequent a hundred years ago, and which, by some ill-informed or unscrupulous writers, are occasionally charged as being common even now, are very rare occurrences, and, when occurring, meet with summary and condign punishment. It is undeniable, however, that excessive beer-drinking, smoking, gaming, and other practices of the less heinous, though by no means harmless, character, are still quite too common in nearly all the universities not to demand the serious consideration of all whose privilege and duty it is to devise and enforce means promotive of the best interests, educational and moral, of the 20,000 to 30,000 students who annually attend them and of the great community of the nation.

The immediate reward that lies at the end of the university course is the doctorate. The degree of licentiate (corresponding, as marked in

another place, to our master's degree) is also given in theology and philosophy, but is seldom sought. Each faculty examines its own candidates and confers its own degrees. For the doctorate there are necessary a certificate of university studies, showing that the candidate has attended the required courses of instruction, an oral examination, a dissertation written in either German or Latin, and payment of the graduating fee, which varies in amount from $80 to $110, but which, in the case of poor, especially meritorious, students, is sometimes remitted.

Thus provided with universally recognized evidence of due preparation for their professional duties, the doctor of philosophy, of law, of medicine, of theology, of natural science, of mathematical and physical sciences, or of political economy, may enter the public service—in Germany each one of the professions, including public instruction, is treated as a branch of the public service—or devote himself still further to the exclusive pursuit of knowledge.

Thus far I have spoken of the general features of the German universities as a whole. Of their present condition, as to support and patronage, and of their relative prosperity, as compared with each other and with the average standard, a brief account is also demanded.

AUSTRIAN UNIVERSITIES.

Austria, though first to follow the example of France, Italy, England, and Spain, in the establishment of universities, has not, during the long period of more than five hundred years since the foundation of the University of Prague, succeeded in keeping the lead. Still her present position is more in harmony with the true university ideal than any hitherto held by her; for while her leading institutions have for centuries maintained a full faculty organization, and one of them—the University of Vienna—has possessed, and now possesses, one of the most complete and most numerously attended medical faculties in the world, it is, nevertheless, undeniable that, until within the present century, none of the Austrian universities have risen to an appreciation of the highest office to be fulfilled by them—the cultivation of true science. The *Brodstudien*, as the German scholar denominates all such studies as aim chiefly at a life-support, had occupied them mainly from the date of their foundation. And even yet the *philosophische Facultät*, in most cases, enjoys less than its legitimate share of attention.

Since the loss of Padua, now at last restored to Italy, Austria possesses nine universities, so called, viz: those of Vienna, Prague, Pesth, Innsbruck, Gratz, Lemberg, Cracow, Linz, and Olmütz. The last two are incomplete, however, (containing less than the four regular faculties,) and are sometimes omitted from the enumeration. The faculties of theology and of philosophy bear the usual German designation, but the faculty of law adds political science, and is entitled *Rechts-und Staatswissenschaftliche Facultät*, while the medical is known as the medical and surgical faculty. The medical faculty is the most prominent of the four faculties in Austria, having more nearly than the rest approached eman-

cipation from that oppressive governmental and clerical control which has so long cramped them and hindered their development. It almost invariably has a larger instructional force, and is more numerously attended; though of late years, at Vienna, the students of law have often outnumbered those of medicine. It has also, as before remarked, a longer period of study (five years) than the other faculties.

Vienna is the scientific and literary Paris of the Austrian Empire, and its university holds a prominence and pre-eminence corresponding to that of the *Acadmie de Paris.* In its theological faculty there are 11 professors and 2 *Adjuncten;* in the law faculty, 20 professors and 5 *Privat-docenten;* in the philosophical faculty, 32 professors, 21 *Privat docenten*, and 7 *Assistenten;* in the faculty of medicine and surgery, 35 professors, 39 *Privat-docenten*, 19 *Assistenten*, and 12 pupil *Assistenten* in the various *Operations-Instituten;* the grand total of the instructional force being 193, of which number, it will be observed, medicine and surgery have nearly one-half.

The number of students inscribed upon the register of the University of Vienna is usually about 3,000. In 1865 the distribution by faculties was as follows:

Faculty.	Winter semester.	Summer semester.
Theology	256	248
Faculty of law and political science	1,082	1,019
Faculty of medicine and surgery	859	811
Faculty of philosophy	380	342
Pharmaceutical branch of medical faculty	141	127
Of extraordinary auditors, *(ausserordentliche Hörer)*	356	307
Totals	3,074	2,854

In the matter of examinations, Austria is an exception to the other German States, her practice in this respect being decidedly more English than German, and the result being scarcely more favorable upon the intellectual development and real progress of her students. The fault does not lie in the fact that the students are often examined, but in the fact that the real use of examinations is now, after so many years of mechanical routine, so far misapprehended that the studies are too often pursued more with a view to the examinations than for their own sakes.

We may presume, however, that with the improvements now making in nearly every department of public instruction in Austria the universities, which should be the sources of intellectual life, will not be overlooked.

UNIVERSITY OF MUNICH.

The universities of Bavaria are nobly led by the University of Munich, which, for the fame of some of its professors, the high character of its instruction in all departments, and the extent and value of its

auxiliary establishments, stands among the very finest institutions of Germany.

The faculty of theology has ten professors and teachers, with the learned and distinguished Dr. Döllinger (who, at the date of my visit, in 1867, was also rector of the university) at its head. The law faculty has 12 ordinary professors and 4 *Privat-docenten*, including many of the ablest jurists of the kingdom. The faculty of political economy has 8 professors, 1 lyceal professor, and 1 *Privat-docenten;* the faculty of medicine, 16 ordinary professors, 2 extraordinary professors, 9 honorary professors, and 11 *Privat-docenten;* and the faculty of philosophy, with the peerless Baron Liebig at its head, has 28 ordinary, 7 extraordinary, and 5 honorary professors, with 9 *Privat-docenten*, and 2 readers; in all, 113 professors and other teachers.

The library of the university includes 16,000 volumes, besides which access is easily gained by professors to the royal library, containing 800,000 printed volumes and 19,000 valuable manuscripts, and, among the numerous scientific establishments, referred to as auxiliaries, the physical and mathematical cabinet; the pharmaceutical institute; the laboratories for physiological chemistry, physiological physics, and agricultural chemistry; the mineralogical, technological, and surgical cabinets; and the anatomical, zoological, and botanical collections, together with the collections of copperplate engravings, pictures, coins, and medals, are among the most extensive and valuable in Europe. There are also more or less intimately connected with the university, and available for its uses, an antiquarium, an observatory, the chemical laboratories of the royal-general conservatories, mathematico-physical, geological, mineralogical, zoologico-zootomical, and anatomical and ethnographical collections, a botanical garden, a general and many local hospitals.

The number of students during the first semester of 1867 was 1,191, distributed among the several faculties and special courses, as follows:

Faculties, courses, and students in 1867.

Faculties and courses.	Natives.	Foreigners.
Students of theology	92	13
Students of jurisprudence	467	43
Students of financial science	2	2
Students of forestry	7	....
Students of medicine	186	36
Students of pharmacy	36	15
Students of philology and philosophy	249	26
Students of chemistry, technology, &c	11	6
Total of native and foreign students	1,050	141

ROYAL UNIVERSITY OF WURTEMBERG.

The Royal University of Wurtemberg, at Tübingen, has been already referred to as embracing the largest number of faculties of any of

the German universities, and as being further distinguished by having two faculties of theology; I might almost have said four.

So marked is the theological side of this institution that, although the several other faculties are provided with able professors and annually draw to them considerable numbers of students, it might nevertheless, with some propriety, be called the theological university. The theologies taught are the Evangelical, Catholic, Greek, and Hebraic, though the last two can hardly be said to constitute regular faculties. The number of professors and students in the several faculties during the first half-year of 1867 will appear in the following table:

Number of professors and students in the several faculties, 1867.

Name of faculty.	Ordinary professors.	Extraordinary professors.	Privat-docenten.	Students.
Evangelical theology	5	....	....	228
Catholic theology	6	1	....	102
Greek theology	1	....	....	1
Hebrew theology	1	....	....	1
Jurisprudence	5	2	1	70
Medicine and surgery	6	1	6	103
Philosophy	9	5	6	83
Political science	5	1	1	68
Natural science	7	3	2	100
Totals	45	13	16	756

The magnificent library of between 300,000 and 400,000 volumes is a surer defense for the old town of Tübingen and the beautiful and fertile kingdom in the midst of which it stands, than was ever the commanding old castle it now occupies, and the various collections, botanical garden, and laboratories, &c., near by in the lower town, are also valuable aids to the high order of instruction there given. The University of Wurtemberg is the crowning institution of an excellent public school system, and one of which the government and people are justly proud.

UNIVERSITY OF HEIDELBERG.

Baden is better known to us in this country, and to the world in general, for its grand old University of Heidelberg than for anything else. Scarcely any university in Europe can present a more brilliant array of great names in the various departments of learning than is presented by the register of its professors. Schwarz, Paulus, and Umbreit, of the theological faculty; Mittermaier, Vangerow, Thibaut, and Rau, of the faculty of law; Chelius, Gmelin, Bunsen, Tiedeman, Schlosser, Baer, and Creuzer, of the faculties of medicine and philosophy—all names cherished by the lovers of science and learning in all countries—have, in turn, each added luster to its early fame. The present number of professors and other teachers is 80; of which 31 are ordinary professors, 20 professors extraordinary, and 29 *Privat-docenten*. The number of

students is about 600; the faculties of law and medicine having 240 and 150 respectively, and the remaining number being about equally divided between the faculties of theology and philosophy. The professors are among the ablest and best paid in Europe; some of them receiving an income from fees, endowments, and state appropriations scarcely less than $8,000 per annum.

The scientific establishments connected with the university are: a museum of natural history, physiological, geological and mineralogical cabinets, chemical laboratories, a botanical garden, a college of agriculture and forestry, an observatory, and a number of seminaries—theological, philological, pedagogical, &c. The library contains some 200,000 volumes, with over 2,000 manuscripts, and is considered one of the richest university libraries in Germany.

UNIVERSITY OF GIESSEN.

Hesse-Darmstadt has long been provided with university instruction at the University of Giessen, now just two hundred and sixty years old. Previous to 1851 it had a large number of professors and students, having been brought to a world-wide distinction by the brilliant discoveries of Baron Liebig in the department of organic chemistry. But in that year, the removal of the Catholic faculty of theology considerably lessened the number of professors and students, and the subsequent removal of Baron Liebig to Munich, in the following year, was a yet severer blow to its prosperity. At present it has 47 professors and teachers, of whom 33 are ordinary, 3 extraordinary, and 11 *Privat-docenten*, and nearly 400 students; much the largest number being in the philosophical faculty, the next largest in the faculty of medicine, and the smallest number, usually about fifty each, in the faculties of law and of Protestant theology. It possesses a large museum, a botanical garden, an astronomical observatory, and a library of about 40,000 volumes.

UNIVERSITY OF JENA.

The Saxons all in common enjoy the possession of the famous University of Jena; whose career of more than three hundred years has been signalized by the services of so many of the ablest scholars of Germany, and whose throng of students (2,000 to 3,000) during the eighteenth century made it an acknowledged center of profound learning for all the German states. Striegel, the philologist, and Sheröter were among the first lecturers, and powerfully contributed to the great prominence it so early attained. Soon after the promulgation of the new philosophy of Emanuel Kant and its espousal and promulgation at Jena, by Rheinhold, the university became, as none other in Europe, the seat of modern philosophy, as taught by Fichte, Schelling, and Hegel, all of whom were professors there; and soon, also, through the connection therewith of the poets Schlegel, Voss, and Schiller; of Göttling, Döbereiner, and Oken, distinguished in the departments of

chemistry and natural history; of Thibaut and Fenerbach, in jurisprudence; and of the theologians, Paulus, Griesbach, and others, a luminous source of literature and science, as well as of æsthetical and biblical criticism. Owing to the injurious influences growing out of the political disturbances of 1814 to 1820, in which the students of Jena became considerably involved, the university not only ceased to grow in prosperity, but so far declined in relative attractions, especially after the rise of the great luminary at Berlin, that it now numbers but 500 students. Still it is, in fact, worthy of being ranked among the foremost institutions of Germany; embracing, as it does, in its corps of 62 teachers of various grades, many distinguished men in the four faculties; possessing a library of 200,000 volumes; extensive anatomical, geological, mineralogical, and archæological museums, excellent chemical and physiological laboratories, and a botanical garden; and having, moreover, in intimate connection with it an agricultural school with the distinguished Stöckhardt at its head; a school of political science; a school for the natural, mathematical, and physical sciences, and seminaries for philological studies and for theology. The university enjoys a fund of its own that yields 12,000 thalers a year, and it receives from the government of Saxe-Weimar and the neighboring duchies and principalities 46,000 per annum; the fees paid by students being sufficient in amount, together with these sums, to support the institution.

Philosophy is still, as heretofore, the ruling faculty at Jena, as will appear by the following tabular statement of the teachers and students belonging to the several departments:

Number of faculties, professors, and students.

Faculty.	Ordinary professors.	Ordinary honorary professors.	Extraordinary professors.	Privat-docenten.	Students.
Faculty of theology	3	1	2	2	141
Faculty of jurisprudence	5	1	3	1	76
Faculty of medicine	6	....	1	2	74
Faculty of philosophy	11	7	10	7	203
Totals	25	9	16	12	494

Of the whole number of students 217 are native, and the remainder foreign. It is claimed for this university that its professors, not only in the theological, philosophical, and medical departments, but also in the department of political science, enjoy an unusual amount of, indeed absolute, liberty.

SAXON UNIVERSITY OF LEIPSIC.

The Saxon University of Leipsic, one of the oldest and wealthiest in Germany, still continues to prosper. It was founded in 1409, with lib-

eral endowments of lands and other property, which it still retains, and which now have an estimated value of $3,000,000, and yield an annual revenue of $300,000. It was here that Thomasius first made (in 1687) his bold innovation upon the old order of things, by lecturing and publishing his programmes in the German, instead of the Latin, language, which last, everywhere up to that date, and for some time afterward in all the other universities, was the only medium of instruction. Besides the possession of large estates—in which respect it differs from most other German universities—it is also peculiar in that it still preserves the old college or boarding hall feature, the only other continental remains of which are found at Bologna and one or two other localities. The students do not all live in commons, but a large proportion of them do, and no less than about two hundred have free support. It deserves to be mentioned, moreover, that all public lectures are free; this extraordinary liberality of free tuition and free support for poor students being rendered possible by an annual appropriation from the state of $130,000, which, added to the income from estates, endowment funds, &c., makes the total annual revenue of the university but little, if any, short of $500,000.

From an early period in the history of the institution, philology has been the favorite department of study; and the relative proportion of students who devote themselves specially to it is greater than in any other. And yet the other faculties have always been prosperous, and each one of them can point to a long list of eminent men who, at different periods, have served as professors; though it is a lamentable fact that of the large number of distinguished men who have graced this university and added luster to German letters, science, and philosophy, a considerable number have been forced to retire for want of political tolerance on the part of the government.

The present number of the instructional force, with their distribution by rank and by faculties, is seen below:

Teachers of various grades in the University of Leipsic.

Teachers of various grades.	Theology.	Law.	Medicine.	Philosophy.	Total.
Ordinary professors	6	10	7	22	45
Extraordinary professors	3	10	16	18	47
Privat-docenten	1	1	8	12	22
Public readers				2	2
Teachers and masters of exercise				2	2
Totals	10	21	31	56	118

The fixed salaries of professors range between $500 and $3,000; besides which they realize considerable sums from fees for their private lectures, which, though moderate, ($4 to $10,) in some cases amount to $1,500, thus swelling the total to $4,500.

The whole number of students in attendance during the summer semester of 1867, upon the several faculties and special courses, was as follows:

Number of students in 1867.

	Native.	Foreign.	Total.
Students of theology	181	86	267
Students of jurisprudence	218	146	364
Students of medicine	137	33	170
Students of surgery	2	....	2
Students of pharmacy	36	9	45
Students of natural sciences	24	27	51
Students of mathematics	16	13	29
Students of philosophy	14	17	31
Students of pedagogy	20	4	24
Students of financial science	10	13	23
Students of philology	39	69	108
Totals	697	417	1,114

The estimated cost of support at this university is from 250 to 1,000 thalers per annum.

The instruction given is amply supported by means of illustration and experiment; including, besides, extensive laboratories, museums, and collections, an observatory and a library of 300,000 volumes, covering the whole field of human learning.

UNIVERSITIES IN PRUSSIA.

Prussia, as remarked at the outset, now has nine complete universities, located at Berlin, Breslau, Bonn, Göttingen, Greifswalde, Halle, Kiel, Königsberg, and Rostock; those of Göttingen, Kiel, and Rostock having been acquired by the late Prusso-Austrian war. They are characterized in general by small endowments, liberal annual appropriations from the state, extensive and valuable equipments, large corps of able professors, the liberty enjoyed by both professors and pupils, partiality for the philosophical studies, thoroughness of scientific culture, a growing appreciation of the claims of industry upon science, and the economical administration of their fiscal affairs.

The annual appropriations to the nine from the state treasury is now about 1,000,000 thalers, of which full one-half goes to Berlin, Bonn, and Göttingen, while the total income from endowments is less than 1,000,000, and from fees not more than one-third of this last amount. This statement conveys a better idea of the high estimation in which scientific culture is held by the government, and of its sound, practical wisdom, in adopting measures for insuring the blessings of such culture to the youths of the country without regard to their station in life, than a volume of wordy eulogy could otherwise give.

My late visits to the universities last above-named, as well as to those

of Halle and Königsberg, gave me particular satisfaction; so that, did the limits of space allow, I would fain devote a chapter to each of them. The magnificent buildings occupied by each, especially those of Bonn, Berlin, and Göttingen; the vast array of their scientific establishments, including museums, cabinets, laboratories, observatories, hospitals, printing establishments, botanical gardens, libraries with hundreds of thousands of volumes—Bonn has 150,000, Göttingen nearly 500,000, and Berlin 600,000—and last, but by no means least interesting and significant of all, their numerous subordinate schools of philology, political and economical science, pedagogy, analytical and technical chemistry, agriculture, and veterinary science; all these are most interesting subjects for consideration, but nothing more than this bare allusion to them in this place is consistent with the plan of my report.

UNIVERSITY OF BERLIN.

Of Berlin, however, as the representative of all Prussian universities, the most perfect embodiment of the German idea of a university hitherto realized, and the most distinguished and influential university now in the world, I must be allowed to write a little more in detail. It originated in an unquenchable desire for intellectual liberty—the acknowledged right and favorable opportunity to fully represent one's own convictions, regardless of their consonance with or their dissonance from all recognized authority. Its establishment in 1810 was effected through the influence of some of the ablest and wisest men of the kingdom, and chiefly in the interest of pure science and the highest intellectual culture. Behold now the result of their labors. It began its career with Wolf, Fichte, Reil, Savigny, and Schleiermacher, each of whom was a shining luminary, shedding abroad the unborrowed light of an independent genius, and at the end of five years the corps of professors and teachers numbered fifty-six, and students had begun to flock to it from all parts of Europe. In the progress of time other clusters of bright stars have been added, including such men as Hegel, Schelling, and Michelet, in speculative philosophy; Marheineke, Neander, and Nitzsch, in theology; Raumer and Ranke, in history; Encke, in astronomy; Ohm and Jacobi, in mathematics; Jungken, Müller, Schönbein, Dieffenbach, and Langenbeck, in medicine; Boeckh, Bopp, Zumpt, the Grimms, Gerhard, and Rückert, in philology; and Humboldt, Lichtenstein, Mitscherlich, Schubarth, Dove, Hofmann, and Ehrenberg, in the natural sciences; until thus, within fifty years, the new university of Berlin has become the most brilliant constellation in the whole firmament of university history.

The present number of professors and *Privat-docenten* is 180; of students, about 2,500; of whom not less than 500 are drawn from all the various enlightened countries on the globe.

Independence of thought and freedom of speech, though at times in danger of serious infringement, are still the privilege of all who teach.

Many of the great ones have long since ended their labors, but their names and fame are an imperishable and precious legacy; and, in many instances, their mantles have fallen upon others scarcely less worthy to wear them. One still finds there the learned Nitzsch, eloquently discoursing on ecclesiastical history and the Epistles of Paul; a score of able jurists, but little less distinguished than Savigny and Gans, laying down the principles of political philosophy and of the civil and canonical law; the authoritative Boeckh, Bopp, and Gerhard, and many others of equal rank, discoursing upon the origin, relations, and development of all the languages of the babbling earth; the venerable and fearless Ranke, dealing as a true philosopher, statesman, and Christian with the histories of nations and of the church; the masterly Ohm, so easily solving the most difficult problems of mathematical analysis; the searching and scientific Dove, sustained by the equally able and now no less distinguished Hofmann and others, unfolding the laws of chemical force; the far-famed Ehrenberg, startling even the multitude of scientific investigators of all lands with his marvelous revelations of the microscopic world; the learned and skillful Mitscherlich and Langenbeck, leading the way to a true science of medicine and surgery; and the redoubtable Michelet, as unweariedly as ever, enforcing his philosophy of life. And these are only the standard-bearers of the host of learned professors and enthusiastic students who so nobly sustain and eagerly press after them in the grand intellectual march of the age.

I have translated a full enumeration of the subjects of the nearly four hundred distinct courses of lectures given in this great *Friedrich-Wilhelms Universität* of Berlin during the winter semester of 1866–'67, and the summer semester of 1867, and feel strongly tempted to embody it entire, that my readers of this country may the more easily realize how thoroughly the whole realm of science, letters, philosophy, and religion is annually overrun and explored by this grand army of the republic of learning. But the length to which this portion of my report has been already carried warns me to bring it to the speediest possible conclusion, and I shall, therefore, simply include the titles of the courses actually given during the first half of said year, together with the amount of time per week given to each; so assorting and arranging them that the relative numerical strength of faculties and of the different classes of teachers will, at the same time, appear.

COURSES OF LECTURES AT THE UNIVERSITY OF BERLIN.—The following is a presentation of the titles of distinct courses of lectures delivered in the several faculties of the University of Berlin during the winter semester of 1866–'67, with the number of hours per week devoted to each:

In the faculty of theology.—By ordinary professors: Special dogmatics, six hours a week; theology of the New Testament and life of Christ, five hours; God's Kingdom till the coming of Christ, one hour; introduction to the books of the Old Testament, five hours; explanation to

the Psalms, five hours; life of Christ, and critical history of the gospels, two hours; history of the Church of the Reformation, six hours; exercises in catechization and preaching, two hours; the same, two hours; practical theology, five hours; the creeds, one hour; symbolical theology, and introduction to the criticisms of the New Testament, five hours.

By extraordinary professors: The Book of Judges, one hour; the Book of Genesis, five hours; life and doctrine of Saint Paul, one hour; the Epistle to the Romans, five hours; the circle of knowledge and metrodology, two hours; church history, part 1, five hours; archæology and patristic study, one hour; homiletics, theoretical and practical, two hours; biblical history, four hours; dogmatics, one hour; the Book of Isaiah, six hours; introduction to the books of the Old Testament, five hours.

By *Privat-docenten.* The Book of Genesis, five hours; prophetical inspiration, two hours; the Book of Isaiah, five hours; Chaldaic and Syriac grammar, two hours; three of Saint Paul's epistles explained, two hours; history of the Christian dogmas, five hours; symbolical theology, one hour; the dogmatical passages in the Old and New Testaments explained, five hours; history of the Christian dogmas, five hours.

In the faculty of law.—By ordinary professors: Psychology of crimes, one hour; natural law, philosophy of law, four hours; criminal law, four hours; criminal procedure, two hours; law of nations, two hours; private German law, commercial law, five hours; practical exercises, one hour; the Pandects, one hour; practical law of the Pandects, six hours; history of English law, one hour; Roman law of inheritance, two hours; common and Prussian civil process, four hours; German and Prussian public law, four hours; canon law, four hours; Prussian law, one hour; metrodology of law, three hours; Prussian civil law, four hours; history of the German Empire and German law, four hours; history of the provincial estates in Germany, three hours; the fourth book of Gaius explained, two hours; history of Roman law, five hours; institutes and antiquities of Roman law, five hours.

By extraordinary professors: History and actual state of the German Confederation, three hours; common law of Prussia, four hours; French civil law, four hours; Catholic and Protestant law of marriage, one hour; Prussian civil law, four hours; Catholic and Protestant canon law, four hours; ecclesiastical and canon law, four hours; practice of ecclesiastical and canon law, one hour; capital punishment, one hour; common and Prussian criminal law, four hours; French criminal procedure, two hours; German public law, rights of sovereigns, two hours; law of nations, three hours; practical exercises in the criminal law, one hour.

By *Privat-docenten:* Prussian law, one hour; history of Roman law, one hour; institutes and antiquities of Roman law, four hours; Prussian civil law, four hours; feudal law, one hour; private German law, one hour; commercial law, maritime law, and law of exchange, four hours;

history of Roman law in Germany, one hour; history of the empire and of German law, four hours; Prussian law of succession, one hour; practical exercises on the jurisprudence of the Pandects, one hour; institutes and antiquities of Roman law, five hours; relations between church and state, one hour; ecclesiastical and marriage law, four hours; German public law, private rights of sovereigns, two hours; Prussian public law, three hours; practical exercises on public and canon law, one hour; private justice among the Romans, two hours; Roman law of succession, three hours; modern law of exchange in Germany, one hour; private law and feudal law in Germany, four hours; commercial and maritime law in Germany, four hours; the *Speculum Saxonicum* explained, two hours; history of the empire and of German law, four hours; interpretation of the solutions in the digests, one hour; metrodology of law, three hours.

In the faculty of medicine.—By ordinary professors: On certain discoveries of the naturalists, one hour; experimental physiology, five hours; practical exercises in experimental physiology, one hour; comparative physiology with the microscope, one hour; general history of medicine, one hour; pathology and therapeutics, three hours; clinical medicine, six hours; diseases of the nervous system, five hours; medical practice, six hours; history of popular maladies, one hour; general history of medicine, three hours; pathology and therapeutics, five hours; hernia, two hours; general and special surgery, four hours; clinical surgery and clinical ophthalmia, five hours; experiments in surgery and anatomy, ——; clinical surgery and clinical ophthalmia, six hours; midwifery, four hours; clinical midwifery, six hours; practical exercises in midwifery, one hour; excitant drugs in medicine, two hours; materia medica, six hours; osteology, one hour; anatomy of the brain and spinal marrow, one hour; general anatomy, six hours; structure of the human body, with the microscope, one hour; practical exercises in anatomy, four hours; methodology of medicine, two hours; general pathology and therapeutics, and their history, four hours; materia medica, with experiments, six hours; pathological anatomy, four hours; practical course of anatomy and pathology, with the microscope, six hours; practical course of pathological osteology, six hours.

By extraordinary professors: Spectacles, one hour; ophthalmology, two hours; the same, two hours; clincial ophthalmia, six hours; practical course of ophthalmia, with experiments, one hour; general surgery, six hours; surgical operations on dead bodies, ——; diseases of children, six hours; errors of modern medicine, one hour; hygiene, one hour; theory and practice of treatment of diseases of the eye, four hours; anatomy of the organs of sense, one hour; osteology and syndesmology of the human body, three hours; public hygiene, one hour; legal medicine, three hours; medico-legal dissection, six hours; the nerves, two hours; clinical study of diseases of the nerves, six hours; toxicology, two hours; legal medicine, three hours; medico-legal dis-

section, six hours; pathology and therapeutics, one hour; auscultation, four hours; clinical lectures on auscultation and percussion, six hours; wounds, one hour; fractures and dislocations, two hours; application of bandages, three hours.

By *Privat-docenten:* Diseases of the teeth and mouth, two hours; diseases of the teeth and their cure, with experiments, six hours; surgical and ophthalmological experiments, ——; drawing up of prescriptions, two hours; special pathology and therapeutics, six hours; venereal diseases, two hours; cutaneous diseases, two hours; clinical lectures on diseases of children, two hours; diseases of the ear, one hour; moral responsibility, one hour; pathology of venereal diseases, one hour; surgery, six hours; legal medicine, two hours; diseases of women, two hours; theory and practice of midwifery, four hours; baths and thermal waters, two hours; drawing up of prescriptions, three hours; physiological effects of gases, three hours; toxicology, three hours; going over previous lectures in physiology and osteology, one hour; theory and practice of midwifery, four hours; operations in midwifery, one hour; clinical study of cutaneous and venereal diseases, three hours; use of the laryngoscope, one hour; diseases of the heart, one hour; percussion, auscultation, &c., three hours; auscultation, percussion, and use of the laryngoscope, four hours; general and special surgery, ——; physiology of animal generation, one hour; physiology of the nerves and muscles, four hours; hernia, one hour; puncture, with experiments, one hour; hereditary vices, one hour; general and special surgery, four hours; auscultation, percussion, &c., one hour; diagnostics, two hours; use of electricity in medicine, one hour; experimental physiology, two hours; going over previous lectures on different points of physiology, one hour; ophthalmology, three hours; use of the ophthalmoscope, one hour; diagnostics, abnormal states of the eye, one hour; theory and practice of midwifery, four hours; operations in midwifery, one hour; thermal waters, two hours; going over previous lectures on pharmacology, one hour; position of the viscera in the human body, one hour; the laryngoscope, one hour; the laryngoscope, auscultation, inhalation, &c., one hour; cure of insanity, the diseases of the brain, two hours.

In the faculty of philosophy.—By ordinary professors: Æschines in Ctesiphontem, two hours; paleontology, five hours; Greek antiquities, six hours; botany, one hour; special botany, four hours; cryptogamia, &c., one hour; meteorology, one hour; experimental physics, four hours; Grecian history, four hours; modern history from 1780 to 1815, five hours; archæology, two hours; Greek mythology, one hour; national economy, four hours; science of finance, four hours; the Persæ of Æschylus, four hours; the *Miles Gloriosus* of Plautus, four hours; politics and political economy, one hour; principles of political economy, four hours; logic and metaphysics, four hours; political economy; theory of finance, four hours; organic chemistry, one hour; experimental chemistry, three hours; the Speeches of Lysias, two hours; the Homeric

Poems, and particularly the Odyssey, four hours; surfaces of the fourth order, one hour; analytical mechanics, four hours; history of Egypt, one hour; grammar of hieroglyphics, three hours; explanation of Egyptian monuments, one hour; physical experiments, one hour; the forty-first book of Livy and onward, one hour; Latin inscriptions, four hours; monuments of the ancient German language explained, one hour; history of the ancient poetry of Germany, four hours; the Germany of Tacitus, four hours; analysis of determinate numbers, three hours; general and special geology, six hours; zootomy, four hours; historical exercises, one hour; modern history of England and of her Parliament, four hours; history of politics, one hour; the Syriac language, one hour; grammar of the Semitic languages, one hour; explanation of the Psalms, five hours; principles of Arabic grammar, three hours; comparison of Persian with Sanscrit, one hour; crystallography, one hour; mineralogy, six hours; the sixth book of Aristotle's Nicomach Ethics, two hours; psychology, four hours; history of philosophy, five hours; theory of analytical functions, six hours; algebraical equations, six hours.

By extraordinary professors: History of modern philosophy, two hours; logic, four hours; general history of philosophy in seventeenth century, four hours; theory of determinates, two hours; algebra, four hours; differential calculus, four hours; physical geography and history of the Mediterranean, three hours; simple drugs examined with the microscope, one hour; botany of medical plants, six hours; pharmacognosy, four hours; certain Arabic authors explained, one hour; Arabic grammar, three hours; the Book of Genesis, five hours; theory of geographical phenomena, three hours; analytical mechanics, one hour; history of astronomy, two hours; theory of the motion of planets and comets, four hours; exercises in archæology, one hour; history of Greek sculpture, three hours; national economy, four hours; the Epidicus of Plautus, two hours; Roman antiquities, four hours; history of Greek philosophy, two hours; æsthetics, two hours; Select Epistles of Cicero, one hour; philological exercises, one hour; Greek mythology, three hours; exercises in paleography, one hour; Latin paleography, one hour; national history of glumaceous plants, one hour; systems of medical plants, six hours; exercises in anatomy and physiology, four hours; ancient geography, three hours; botany, diseases of plants, four hours; agronomical science, one hour; historical exercises, one hour; history of Germany, four hours; art of singing, especially church singing, two hours; musical composition, four hours; pedagogy, two hours; the Nibelungen, six hours; exercises in deciphering manuscripts, one hour; logic, encyclopedia of philosophical sciences, four hours; history of philosophy, four hours; history of the New World, two hours; geography and ethnography of Europe, four hours; the Chaldee language, one hour; history of the Armenians, one hour; general history of physics since Galileo, two hours; theory of electricity, one

hour; physics applied to mathematics, acoustics, four hours; chemical metallurgy, three hours; principles of qualitative and quantitative analysis, one hour; experimental chemistry, six hours; pharmacy, three hours; chemical experiments, eight hours daily; the Turkish language, three hours; principles of national psychology, one hour; philosophy of language, general grammar, four hours; character of the Indo-Germanic languages, four hours; universal history of the arts, five hours; the Sacontala of Calidâsa, two hours; Sanscrit grammar, three hours; Zend, or Pâli, grammar, two hours; the Rigveda, or the Atharvaveda explained, one hour; course of Sanscrit, Zend, or Pâli, one hour; the dramatic art, one hour; psychology and anthropology, three hours.

By *Privat-docenten:* Experimental organic chemistry, four hours; experiments in organic chemistry, six hours; Schleiermacher, one hour; logic and encyclopedia of the philosophical sciences, four hours; the limits between poetry and philosophy, one hour; the American Political Economist, Henry Carey; logics and metaphysics; political economy; history of modern civilization; agronomical zoology, three hours; entomology, three hours; the Koran, two hours; the Semitic dialects, one hour; differential calculus, four hours; analytical geometry, four hours; the Bhagvatgita, one hour; Panini's Sanscrit grammar, three hours; Hindustani, or Pâli, grammar, two hours; Indian philosophy, one hour; the Satires of Juvenal, two hours; syntax of the Latin language, four hours; Lucretius, *De Rerum natura*, one hour; rhetoric and rhetorical exercises, two hours; Aristotle and the natural philosophy of the ancients, four hours; history of the German universities, one hour; systems of modern philosophy since Kant, four hours; experimental chemistry, six hours; the Olynthiac orations of Demosthenes, one hour; the Epistles of Horace, four hours; physics applied to mathematics, acoustics, optics, &c., three hours; general geology; natural history of *Entozoa*, one hour; general zoology; the climate of Italy, one hour; medical climatology, two hours; conversational lecture on chemistry, one hour; history of chemistry, one hour; qualitative and quantitative part of analytical chemistry, three hours; medico-legal chemistry, three hours; chemical experiments, eight hours daily; theory of irrigation and drainage, one hour; principles of agriculture, three hours; management of cattle, three hours; book-keeping, one hour.

By *readers*, (for modern languages:) Lectures in Italian on Italian literature, two hours; Italian grammar, two hours; lectures on the Italian and French languages, two hours; German short-hand, two hours; German, English, French, and Italian short-hand, two hours; lectures in Polish on Persian grammar and the Zend language, two hours; the Turkish language, Kirk Vezir read, three hours; practical lectures on the Persian and Turkish languages, two hours; lectures in English on English literature down to the sixteenth century, one hour; lectures on the English language, two hours.

But this magnificent array of courses of instruction does not complete a fair representation of the facilities afforded by the University of Berlin; they are sustained by material aids no less remarkable. The royal library, with over five hundred thonsand volumes, and the special university library, for the exclusive use of professors and students, of over one hundred thonsand volumes, are daily open to all members of the university, and the astronomical observatory, botanical garden, extensive anatomical, zootomical, and zoological, geological and mineralogical musenms and collections, collections of surgical instruments and bandages, varions chemical, physical, and physiological laboratories, full pharmacological collections, the colleetions of charts of the Royal Chartographical Institute, a rich collection in Christian archæology, the musenm of arts, collectious of plaster casts, &c., are likewise always accessible, as occasion requires, and to students of all classes, on application to the proper authorities; while, for the department of medicine and surgery, there are: the anatomical theater and physiological laboratory, the medico-surgical polyclinical institute, the clinic for surgery and the treatment of the eye, and the obstetrical clinic and the polyclinics, all in the great *Klinikum* of the univerity, the university clinic at Charity Hospital, numerous general medical and surgical clinics, a surgical operative clinic for the special benefit of students of eye surgery, a clinic for the treatment of syphilitic diseases, a cliuic for the treatment of lying-in women and their infants, and, finally, the pathological institute and the institute for practical exercises in medical jurisprndence at Charity Hospital. The Royal Veterinary School at Berlin and the Agricultural School at Potsdam are also now connected with the university and afford excellent facilities for either the incidental or thorough special study of the sciences they were designed to promote.

SUPPORT OF THE UNIVERSITY OF BERLIN.—For the support of the University of Berlin there is annually expended the snm of about 200,000 thalers, or $150,000. The exact amounts received and expended in the year 1865, with the sources thereof and the general objects to which they were applied, will appear by the following statement:

	Thalers.
Reeeived from the state	189,069
Received from endowments	50
Received from students as fees	7,557
Received as interest of capital	111
Total	196,787
Expended for administration	10,804
Expended in salaries	102,400
Expended upon university establishments	70,230

	Thalers.
Expended in aid to students	350
Expended in repairs and taxes	2,000
Reserve	11,003
Total	196,787

After a glance at the above figures one hardly knows which most to admire, the munificence of the government in annually bestowing upon a single one of its nine universities the sum of over $141,000, or the economy of an administration through whose management so vast an institution is so well sustained. It must not be forgotten, however, that these figures do not represent the amount actually consumed in the education of the twenty-five hundred students who attend upon its courses of instruction. Besides the 7,557 thalers paid as regular fees for courses of public lectures not entirely free, they also pay in the aggregate very considerable sums for the great number of private courses delivered by both professors and *Privat-docenten*. It is these fees for extra lectures, voluntarily attended by ambitious students, that swell the 102,400 thalers above mentioned as salaries of professors to an amount sufficient for their comfortable—in some cases, very handsome—support.

As it regards the support of the professors and teachers, it should lso be remarked that very many of them derive incomes more or less arge from their published works, of the number of which we have in this country but a very imperfect idea, owing to the very different conditions of professorial life here and there.

SWISS UNIVERSITIES.

The universities of Switzerland are of a type so essentially German and, as compared with the great institutions just reviewed, possess so little importance that I feel warranted in passing them with a very brief notice.

Being German in constitution, in the general character of their instruction, (which is also chiefly given in the German language,) in the nationality of their professors, most of whom were educated in German institutions and many of whom are actual natives of the German States, transplanted to the Swiss soil for the benefit of their superior culture and scientific spirit, it is not because of any serious defect in themselves that they hold a position of so little relative importance among the universities of Europe. On the contrary, the true reason seems to be found in the lower university ideal as cherished by the Swiss nation. The Swiss are, in the popular sense, a well educated and a universally educated people, as I have incidentally shown in previous chapters, but they are neither a highly educated people nor appreciative, as a large body of the Germans are, of the real value of the highest culture. Not

that they are without the capacity to appreciate it, but that they are now pre-eminently practical in their aims and have not yet fully entered upon the higher stage of national development. Their philosophy is still of the mechanical sort, so to speak, and cannot, therefore, yield large intellectual results. They maintain excellent common schools, which, however, show marked realistic tendencies, and they are building up a grand *Polytechnikum*, which, even now, within thirteen years from the date of its foundation, is beyond the rivalry of any and all institutions of its kind except the famous *badische polytechnische Schule* of Carlsruhe. But all these are plants which, when once rooted, have a rank and easy growth, belonging rather to the carboniferous period, so to speak, of the educational development of an industrial nation, whereas the true university demands a purer atmosphere, and must of necessity wait a little longer for its healthiest growth and most perfect development.

The three Swiss universities are located at Basel, Bern, and Zurich. They are all cantonal rather than national, and, in equipment, support, and patronage, barely occupy a respectable position among the third-rate universities of the continent. They are supported by the cantons where located. The teachers—here, as in Germany classified as ordinary professors, extraordinary professors, and *Privat-docenten*—are appointed by the council of state on the nomination of the council of education; the church council having also a voice in the nomination of theological professors. The ordinary and extraordinary professors of each faculty annually elect one of their own number dean of faculty, and the four deans thus elected, together with the ordinary professors constitute the *senatus academicus*, which is the governing body of the university, as to all matters of instruction and discipline, with the right to be heard before the education council can make any change in the general regulations, and which, subject to the approval of the council of state, has also authority to choose a rector for the immediate execution of its will.

The standard number of professors is five for each of the faculties of theology, law, and medicine, and fourteen for the faculty of philosophy; though actually the number varies a little in the several cases, and is in all somewhat higher. The number of the *extraordinarii* and *Privat-docenten* at Zurich is nearly equal to that of regular professors; while Bern and Basel, having less power to attract teachers of these classes, are pretty much without them. The number of students ranges between one hundred and three hundred; the largest number being found at Zurich.

The Zurich University, more commonly known as the *Hochschule*, is peculiar in that it exists in connection with the great polytechnic school, occupying a portion of the same magnificent new edifice, and both giving and borrowing instructional service. Thus far the fruits of this intermarriage have been of mutual advantage and great general satisfaction. The intellectual activity and energy so strongly characterizing the

Polytechnikum has awakened new life in the *Hochschule* and the pure love of culture for its own sake, the *wissenschaftliche Geist* of the *Hochschule* has a perceptible influence in raising the standard and elevating the tone of the *Polytechnikum*.

In view of all the elements involved, I feel safe in predicting a gradual rise and a future highly honorable position for Swiss university education.

UNIVERSITY EDUCATION IN HOLLAND.

The first Dutch university, the University of Leyden, was planted by the Prince of Orange in token of his gratitude for the rescue of that city from the starvation and destruction threatened by Spanish enemies, and as a reward for the sufferings and heroism of his people. And a noble reward it proved; for although founded as late as 1575, through its influence as a nursery, and the attractions it offered to the learned men of many lands, the seventeenth century had not reached its noon ere Holland was reckoned "the most learned country in Europe," and Leyden received the proud title of "Athens of the West." It was here that were first trained the wonderful powers of a Grotius; where those distinguished philologists of their time, Scaliger, Heinsius, and Gronovius, taught belles-lettres, and wrote their numerous works; where Arminius so successfully studied theology, and afterward, as professor and author, promulgated those religious doctrines which, while they brought bitterness to his life, added luster to the already famous university and connected his name inseparably with the faith of so large a division of the great Protestant Church of the world; where the great Boerhave, most distinguished physician of his time, "the modern Hippocrates," instructor of Peter the Great, both studied and taught by his own genius; so widening the fame of the university as a school of medicine that large numbers of students were attracted to it from all parts of Europe; and upon whose now venerable register a long list of names eminent in every department of learning—a list far too long for enumeration here—are found inscribed.

The other two Dutch universities are located at Utrecht and Groningen. Though both established early in the seventeenth century, and both somewhat distinguished, Utrecht more especially so, they neither of them have ever attained to anything like the celebrity of Leyden. In the form of their organization all three were modeled after those of Germany, and they are still strikingly like them. They have five faculties, however, instead of four; the faculty of philosophy being divided into the faculty of letters and theoretical philosophy (*facultas philosophiæ theoreticæ et literarum humanorum*) and the faculty of mathematics and natural philosophy. The professors are almost exclusively of one class; extraordinary professors being rare, and *Privat-docenten* (here known as readers, *lectores*) rarer still, and the instruction is almost wholly given in the Latin language. In the last-named particular they

afford a striking illustration of the tenacity and obstinacy of the Dutch mind. As when blockaded and besieged, the people would perish of famine and pestilence rather than surrender, so having organized their universities at a time when in all countries university lectures were of necessity given in Latin because there was no other learned language, they still persist in the practice although all other European institutions abandoned it more than a hundred years ago; and though their own language has meantime attained to a high degree of perfection. It was my good fortune to be present at both Utrecht and Leyden on the occasion of their commencement days, and throughout all the exercises, including graduating discourses and their discussion and criticism, by members of the examining boards, addresses baccalaureate by the rectors, &c., I heard no single word but Latin. And it is worthy of remark that not only was the Latin of the written compositions and premeditated discourses of a quite different character from that of the salutatory orations and other productions so commonly heard at our own college commencements, which, as a rule, neither greatly honor the elegant models left by Cicero and Hortensius, nor reflect much credit upon the classic attainments of their authors, but the extemporaneous remarks of these accademicians of Utrecht and Leyden seemed as free as in their own flexible, rich, and powerful vernacular.

In such strongholds of classic element, it should be expected that in the association of faculties, letters and the two professions more especially served by letters, viz., theology and jurisprudence, would be the ruling powers. And accordingly we find that, so far as patronage is concerned, such is the case; for of the 541 students at Leyden during the summer term of 1867, 292 were devoted to law, 78 to medicine, 27 to mathematics and philosophy, 42 to letters, and 72 to theology; while at Utrecht nearly 200 are students of theology, and over 200 are in the faculty of jurisprudence.

But then this prominence of the classic element is not here, as in some of the other universities of Europe—especially those of England—preventive, or even repressive, of the newer and now everywhere growing element of modern science. This remark is especially applicable to the University of Leyden, whose faculty of medicine again outnumbers that of theology, and whose *facultas mathesis et philosophiæ naturalis* (*mathesis* here embracing, not only the pure mathematics, but also physical science and practical astronomy, and *philosophia naturalis* not only chemistry inorganic and organic, theoretical and practical, but likewise the whole field of natural history) has the most numerous corps of professors and is supported by a fine array of auxiliary establishments, including a beautiful and extremely valuable botanical garden, some of whose trees were planted by the hand of Linnæus, and which was long esteemed the richest garden in Europe, especially in plants of oriental origin; a splendid new observatory; a new physical laboratory, with a valuable cabinet connected; a new chemical laboratory admirably

arranged and well equipped; a new physiological laboratory; an exceedingly rich cabinet of comparative anatomy; one of the most extensive and valuable museums of natural history in the world; a rich museum of coins and medals; a museum of agricultural implements and products; galleries of statuary and paintings, antique and modern; and a library of nearly one hundred thousand volumes and some fifteen thousand manuscripts, many of them exceedingly rare and valuable. Its students also have easy access to the public herbarium, and to the ethnographical and Egyptian museums. The several new buildings for the library and scientific establishments are substantial and elegant, reflecting much credit upon the intelligence and liberality of the government.

The cost of maintaining the three universities of Holland will appear from the following figures kindly furnished me by the learned rector of Leyden:

For what expended.	Leyden.	Utrecht.	Groningen.
	Florins.	*Florins.*	*Florins.*
Salaries of curators	1,350	1,100	1,150
Salaries of professors	117,420	67,313	64,206
Material	137,872	28,935	41,106
Subsidies for students	....	....	3,000
Totals	256,642	97,348	109,456

Students at Leyden pay 30 florins (of 41 cents) for a course of three or more lectures per week for the first year; after that, nothing; for a less number of hours per week, 15 florins. Students of chemistry have free use of the laboratories; students of anatomy for laboratory privileges, 30 florins per annum; students of physiology for the use of the physiological laboratory, 15 florins. For a time after admission all new-comers must play drudge (fag) to the more advanced students—another absurd relic of mediæval times not yet rooted out. The highest salary to ordinary professors is 2,800 florins; the lowest to extraordinary professors, 1,600. At Utrecht the salaries are a trifle lower, and at Groningen still less, owing to the small amount derived from the fees paid by students, who rarely number more than two hundred.

The number of professors in the several faculties is much too small to insure their most successful working; the average per faculty being less than six. At Leyden there are 26 professors—5 in the faculty of jurisprudence, 5 in the faculty of letters and philosophy, 7 in the faculty of mathematics and natural philosophy, 5 in the faculty of medicine, 4 in the faculty of theology, and 3 readers; in all 29. At Utrecht the whole number of teachers is 22; at Groningen, 21. It is impossible that so small a number of professors should occupy the broad field embraced by these universities and cultivate it in all parts thoroughly. But the infusion of new life, as evidenced by the creation of new auxiliary estab-

lishments and the enlargement of old ones, at great expense, is a circumstance of present encouragement, and there is reason to believe that the next step of the government will be to add to the instructional force, until Holland will again be enabled to rank, in the prosperity and greatness of at least its leading university, with the foremost nations of the world.

THE UNIVERSITIES OF BELGIUM.

The Universities of Belgium, like its mixed population, are partly German and partly French; the French element rather predominating.

Two of them—those of Liege and Ghent—are government institutions; one of them—the University of Louvain—is maintained exclusively by the Catholic Church; and the fourth, located at the capital, is a *free* university. None of them are, in the German sense, real universities, but all are quite prosperous, and those of the state are slowly moving in what seems to me the right direction.

Louvain, the oldest of them all, (founded in 1426,) at one time ranked among the leading universities of Europe; having in the sixteenth century as high as six thousand students, grouped, after the early fashion, in forty-three colleges. It has held with much tenacity to most of its original features, and, as judged by its own ideal standard, is still quite prosperous. The library is one of the largest in Belgium, and the museums of mineralogy and zoology, as well as its botanical garden, are highly respectable. The number of faculties is five—letters and philosophy, sciences, law, medicine, and theology; number of colleges, 20; of professors, 49; of students, about 700.

The royal and free universities belong wholly to this century; Ghent having been founded in 1816; Liege, in 1817; Brussels, in 1837. They agree in all essential particulars, so that an account of one would answer very well for all. The characteristic features, as distinguished from those of Germany, are the following: Each of them contains four faculties—those of letters and philosophy, sciences, law, and medicine. Each also embraces a special school of applied science; Liege, a school of mines; Ghent, a school of engineering; and Brussels, a school of pharmacy. The instructors are *professeurs ordinaires*, *extraordinaires*, *honoraires*, and *émérites*, and *docteurs agrégés*. And they, in common, confer the two degrees of *candidat* and doctor upon very nearly the same conditions. They also agree in the main in their regulations relative to the payment of students' fees; payment being made per annum or per full course essential to a degree, instead of per lecture or single course of lectures, as in Germany. The fees are higher than in the German and Italian universities, but lower than in the French; matriculation about 15 francs; fees for all the classes in each faculty, 200 to 250 francs per annum.

The state universities each receive from the government the sum of 350,000 francs per annum; the independent University of Brussels,

moderate aid from the city and province of its location. Liege and Ghent have been provided by the government with much in the way of museums, cabinets, libraries, botanical gardens, &c.; while the University of Brussels finds easy access to the magnificent collections belonging to the city, and is gradually making accumulations of its own.

The University of Liege is rather the more flourishing of the two government institutions; its advantage appearing to be due, in part at least, to the circumstance of its location in the midst of rich mines, easy access to which, on the part of its students, has made its school of mines especially attractive to a large number of influential citizens, and thus secured to it a general and cordial support. The number of its teachers is 60; of its students, including 300 in the school of mines, 750. Its library is one of the most extensive in Belgium.

The University of Ghent derives similar and large advantage from its school of engineering, which adds 200 pupils to the 300 in attendance upon the instruction of the four faculties, thus making a total of 500. The number of professors and *agrégés* is 50. It is provided with new and elegant buildings, and possesses a fine library, well arranged laboratories, and valuable collections for the use of the faculty of sciences and the school of engineers.

The examination of candidates for degrees in the case of the state universities is never by the faculties in whose name they are conferred, but by a board of examiners appointed by the King from among the scientific and learned men of the kingdom, on the nomination of the legislature and ministerial departments—two by the senate, two by the house of representatives, and three by the ministers. This board, aided by under-boards for each of the four faculties, holds regular *concours* at Brussels, and, like the University of London, awards to such applicants as present themselves under regulations affording general guarantees of their claims to an examination; and awards diplomas and degrees to those properly qualified, without regard to the place or other circumstances of their instruction. The degree of doctor, however, can only be conferred upon such as already possess the diploma of *candidat*.

The *free* university of Brussels has regulations somewhat different. The state has nothing to do with it, and it also professes to be free from sectarian bias in the administration of its affairs, the control of which is intrusted to a council of administration of the university, comprising the administrative inspector of the university, the rector, the secretary and treasurer, and with the burgomaster (mayor) of the city as president. The matriculation fee is the same (15 francs) as in the universities of the state, and admission is gained by the fulfillment of other like conditions as to qualification, viz: such attainments in the various branches of a general education as are acquired at the *athenæ* of the country. Upon registering his name upon the roll of the university, each student pays a general fee for all the courses relating to the subject-matters embraced by the examination for the degrees to which

he aspires. This payment secures the right to attend upon said courses until the student has attained the degree for which he inscribed; although this privilege may be withdrawn by the rector, with the advice of the faculty concerned, at the end of the second year. In amount, the fees for the courses requisite to a degree range between 100 francs, for the shortest term and first diploma in pharmacy, to 250 francs for the courses required for the doctorate. Doctors of law who aspire to the special doctorate in the political and administrative sciences must pay, besides the 15 francs, (price of subscription,) a fee of 80 francs; *candidats* in law, 150 francs. The authorities of the university may also allow inscriptions for certain separate and single courses of instruction; in which cases, besides the matriculation fee, each student thus enrolled must pay 80 francs for each course of lectures in the faculty of law, and 60 francs for each course in any of the other faculties.

The diplomas conferred by the University of Brussels are of two kinds, *diplômes honorifiques* and *diplômes scientifiques*. The honorary diplomas are confined to the degree of doctor, and are conferred and delivered, without expense and without examination, by the council of administration of the university upon the unanimous proposition of the appropriate faculty, but to such persons only as have shown extraordinary merit, either by their writings, their services in the department of instruction, or in the science or profession for which the diploma is conferred. The *diplômes scientifiques* are conferred by the faculties themselves, after a public examination in the whole range of studies embraced in the prescribed course. The statutes provide that no one shall be admitted to an examination for the degree of doctor in one of the four faculties unless he has been inscribed at the university during at least one year and is already possessed of the diploma of *candidat* in the same faculty. So, likewise, the aspirant for the diploma of *candidat* in law must first have the degree of *candidat* in the faculty of philosophy and letters, and the aspirant for the degree of *candidat* in medicine the diploma of *candidat* in the sciences. Upon persons graduated by the board of examiners of the state, like degrees are conferred on the presentation and defense of a thesis to the satisfaction of the faculty. Examinations can take place at any time during the year, except during vacations, are public, both oral and written, and are conducted in either French or Latin, at the discretion of the aspirant. The subject-matters upon which examinations are made by the several faculties for the different degrees have been given already in the chapters on schools of letters, schools of science, schools of law, and schools of medicine, and need not be repeated here. They are comprehensive, and, judging from the observations I have been enabled to make during a short stay on two different occasions, also quite thorough.

When the examination of any candidate is concluded, the examiners pronounce a nicely discriminating judgment upon his qualifications;

declaring either simple admission, admission with distinction, admission with great distinction, admission with the greatest distinction, adjournment, or rejection, according to their conception of his real deserts.

Besides the degrees already named as regularly conferred by the faculties, the degree of *docteur agrégé de l'université* (with the same force as the title of *Privat-docent* conferred by the German faculties) is given by the several faculties, and, upon the recommendation of the proper faculty, may be granted by the council of administration without the usual examination; the candidate simply writing and defending a thesis. Such regular graduates as obtain diplomas marked "with great," or "with the greatest distinction," are by that circumstance made *docteurs agrégé* to the university, and, as such, may, on the recommendation of the faculty whose diploma they hold, be charged with a determinate course of study.

All diplomas granted are signed by the professors who take part in the examination, by the rector, and by the administrative inspector of the university.

Aspirants *adjourned* may, after three months, present themselves again for examination without further expense; aspirants *rejected* may try again after six months, on payment again of half the usual fees, which, for the different kinds of examinations and diplomas, range between 40 francs and 200 francs.

The present number of professors and *docteurs agrégé* in the University of Brussels is over 50. The highest salary paid is 5,500 francs, the lowest 1,000 francs. The number of students during the summer semester of 1867 was 450. Adding these figures to the foregoing, we have for the whole kingdom of Belgium, a total of 210 university teachers, and of students, 2,300, or one to every 1,950 inhabitants.

SCANDINAVIAN UNIVERSITIES.

Under this head I shall include the Danish University of Copenhagen, the Swedish universities at Lund and Upsala, and the Norwegian University of Christiania. Denmark formerly had a second university at Kiel, but that institution has, by recent absorption, become Prussian.

The University of Copenhagen, (founded in 1475,) was molded after the early German universities, and in the main has kept progress with them, although the narrow limits of the country and the comparatively large number of the people who speak the German language in preference, and hence interest themselves in German institutions and literature more than in their own, have always been a serious hinderance to its development. Its internal affairs are managed by a *senatus academicus*, or consistory, composed of a certain number of professors from the several faculties, to wit: two from the theological faculty, two from the medical faculty, three from the faculty of philosophy, two from the faculty of jurisprudence and political science, and two from the faculty of

the mathematical and natural sciences, the membership of which persons is determined by seniority, together with five additional members, chosen by the whole body of professors from their own number. The executive officer is the rector, who is chosen by the professors for the term of one year.

The whole number of professors and docents is 77; 7 belonging to the faculty of theology, 9 to the faculty of law and political science, 16 to the faculty of medicine, 22 to the faculty of philosophy, and 12 to the faculty of mathematics and natural science. Many of them are distinguished scholars, who, not only by their teaching in the university, but also by their published writings, have largely contributed to the progress of learning and science everywhere. Their salaries vary according to length of time spent in the service; beginning with 1,200 rixdollars (of 54 cents) and being increased by 200 rixdollars every three years. The highest salaries paid at present are 4,000 rixdollars.

Applicants for admission as students must bring with them a certificate of good character from their religious pastor, and from the head of the Latin or learned school where they have been students, of their having completed the course of study therein. They are then examined by the rector and received or rejected at his discretion. They pay a matriculation fee of about $5, and such as can also pay a tuition fee of $4 or $5 per semester. Students who practice in the laboratory pay a further fee of 24 rixdollars per semester. Since 1853 130 poor students have received 12 Danish dollars, with free lodgings, fuel, and 2 rixdollars per month for service in aid of their support. These stipends are tenable by each stipendiary for the period of four years, during which he lives *in commons* with others of the same class. Students not thus aided live where they choose, simply visiting the university for the lectures and practical exercises. The whole number in attendance is over 1,000.

The auxiliaries to scientific study are good, the collections in natural history, for which an extensive and beautiful building has just been completed, especially so; the cabinets and laboratories are valuable and the library, of 260,000 volumes, for which an elegant and admirably planned building has been here erected within the past five years, is one of the richest university libraries in Europe.

Besides the faculties above enumerated, there is connected with the University of Copenhagen, as I have elsewhere stated, a school of applied science *(polytechniske Læreanstalt.)* This school, as a separate polytechnicum, has been in existence for some time, but has only just lately been consolidated with the university. For a more particular account of it the reader is referred to that chapter of my report in which all institutions of this class are specially considered.

For the support of the Danish University there is a fund of some $1,860,872, and all deficiencies are made up by the government.

The universities of Sweden are also mediæval in origin. Not only so; in forming them, their founders rejected the then more recent examples

of improvement set them by the newly organized universities of Austria and Germany, and adopted the first models, going even back to Oxford and Cambridge, Paris and Bologna. And, what is more remarkable still, regardless of all the changes—the rest of the world would say progress—of the hundreds of years of their history, they have preserved, even to the present hour, almost the exact form of the mold in which they were originally cast. Indeed, they are more primitive, in some respects, than their great prototype of six hundred years ago; for they not only gather their students into *nations*, each with its own house, officers, and discipline, and compel every student entering to join one of them, but they have always paid, and still continue to pay, their professors' salaries partly in corn, wood, and such other articles of home consumption as are produced upon the university estates.

They are both state institutions, governed by the same royal statutes, and managed in precisely the same way, through chancellors, pro-chancellors, and consistories, very much after the manner of Oxford and Cambridge.

The King is the primal source of the organizing power, and but little is done without his consent. In the first place, he appoints the chancellor and all the professors, secretaries, &c. These last all together constitute the *consistorium academicun majus*, whose prerogative it is to nominate the pro-chancellor and the rector to the King and chancellor respectively, by whom the appointments are made. The consent of the consistory is also necessary to any arrangements for the internal management of the institution that may be proposed by the pro-chancellor or chancellor. The chancellor is some nobleman in high position, and the pro-chancellor is either an archbishop or the bishop of the diocese in which the university is located.

The immediate supervision of the university is intrusted to the rector, who can neither be nominated by the consistory nor confirmed by the chancellor until after he has been a professor for at least two years; as in Germany and several other countries, his term of office is only one year. The law makes him directly subject to the pro-chancellor, so that he cannot even be absent from the institution more than eight days without his consent.

The faculties of the Swedish universities are the same in number and title as in Germany, and the head of each is also a dean (*Decanus*) of its election. The teachers (*Lärare*) are professors, adjuncts, and docents.

The students gain admission through certificates of moral character and proficiency in study, and through examinations by the rector. The matriculation fee is about $5 70; fee for private lectures, $1 50 to $3 per semester. All public lectures are free. As soon as matriculated, all are required by law to unite with some one of the *nations*. In former times—from 1750 to 1852—the university authorities had complete jurisdiction over all classes of offense by students and other members of the university and their families, whether against the discipline of the institution or against the laws of the land, within a circuit of one mile; but

by royal edict of the year last named such jurisdiction was limited to cases of discipline merely.

Each *national* organization comprises one inspector, who is always a professor; seven to nine honorary leaders, who are professors, doctors of theology, philosophy, &c., bishops, military officers, and other officials; one curator, who is either an adjunct professor or *Docent;* and members, classified as seniors, (of whom there are two to four,) juniors, (including the great body of the *nation*,) and novitiates, or new-comers. Thus constituted, the *nation* is a sort of independent state, with its own constitution, laws, and regulations, and amenable only to the royal statutory provisions governing the university itself. Sometimes several nations are embraced under one national title, as the *Skänska Nationen*, and others at Lund, in which case they are subject to one common "inspector" and one set of "honorary leaders;" but each division has, in other respects, the full national organization.

The University of Upsala, founded 1476, is the more famous of the two; its greater distinction being largely due to the attention of the world having been drawn to it at an early day by men of unusual attainments, and during the first half of the last century by the great Linnæus, who there studied and afterward taught, and who, by contributions never surpassed in value by those of any naturalist, fastened upon Upsala the admiring eyes of all men of science throughout the world. It has, accordingly, been always liberally dealt with by the government and largely attended. The present number of professors and adjunct professors is 55; 4 professors and 4 adjuncts belonging to the faculty of theology, 4 professors and 2 adjuncts to the faculty of law, 5 professors and 5 adjuncts to the faculty of medicine, and 17 professors and 14 adjuncts to the philosophical faculty. The number of students is, of late years, about 1,500. The library of the university contains over 100,000 volumes, and the numerous scientific establishments, including an astronomical observatory and various laboratories, cabinets, &c., are quite extensive. The botanical garden owes much to Linnæus, and is still one of the first that I have seen in Northern Europe.

The University of Lund, founded 1479, is also provided with the various aids to literary and scientific study; the library, of nearly 100,000 volumes and several thousand manuscripts, being especially rich in works of antiquity, and the natural history collections, especially the collection of birds, among the best in European universities. The number of teachers is 65, distributed as follows: 4 professors and 3 adjuncts in the faculty of theology; 4 professors and 1 adjunct in the faculty of law; 5 professors and 2 adjuncts in the faculty of medicine; 16 regular professors, 3 professors *emeriti*, 13 adjuncts, and 12 *docents* in the faculty of philosophy. The number of students is, at present, 400, all of whom are embraced in seven *national* groups, known as Götiska, Smälands, Skänska, (embracing seven divisions, each with its own curator, seniors, and juniors,) Blekingska, Göleborgs, Kalmare, and Wermlands *Nationen*.

While their ancient form is preserved, it is, nevertheless, perceivable that in spirit the old universities of Sweden are coming of late years more into harmony with the progressive spirit of the present age; and it is more than probable that the now steady growth in them of what they call the *new* sciences will break the mediæval shell ere long and give to them a freer and more perfect development.

The only university in Norway is the University of Christiania, founded in 1811. Belonging wholly to the new era in university history, and organized soon after the founding of the great University of Berlin, it wisely discarded the old models of the Middle Age and adopted an essentially German plan. It possesses the four faculties of theology, law, medicine, and philosophy, and has 34 professors, and between 700 and 800 students. Pupils are admitted from the Latin schools of the country after an examination in Latin, German, French, the natural and physical sciences, arithmetic, and geometry, and the payment of a matriculation fee of about $6. They are then known as *students* and *citizens* of the university, and are free to attend on all the public lectures without payment of tuition or other fees, except in the laboratories, where they are required to pay the cost of material consumed by them. The first and lowest degree conferred is that of *candidat;* the examination for which, though free to all students, is of such grade as usually to require about two years of diligent study. Some accomplish the work necessary to promotion in a less time, and many students, by reason of partial occupation as teachers in the country schools and otherwise, employ a much longer time in fitting themselves for the *Candidats-Examen.* The titles of master and of doctor in the faculty of philosophy are only occasionally conferred or sought; many learned men and even professors never making application for higher honors, the title of doctor not being essential to the practice of a profession, the faculties of law, theology, and medicine only occasionally are called upon to confer it upon other than such as aspire to some public office for which the rank of *candidat* is not sufficient. The scope and character of the examinations for the professional doctorates are such that a continued study, after candidacy, of about three or four years in the faculties of theology and law, and of five or six years in the faculty of medicine, is found necessary.

The government has enabled this university to gather about it a library of over 120,000 volumes, and numerous natural history and antiquarian collections, and to create a well equipped astronomical observatory and other scientific establishments of considerable extent and value.

As compared with the German ideal, or even with its actual, none of the several Scandinavian and other universities of the northern countries are as yet fully worthy of the proud title they bear. But I think I have shown that they have all entered the way of progress and are destined to attain to that higher standard at a not far distant day.

RUSSIAN UNIVERSITIES.

Naturally enough, Russia was the last of the European nations to establish universities. Nor even yet has she made great progress in that direction, the present number of such institutions in the whole empire being but seven, with a total of students scarcely exceeding 5,000, or one to every 14,000 inhabitants. The first university established by the Russian government was that of Moscow, founded in 1755; for, though the University of Dorpat dates back to 1632, it was not of Russian origin, having been founded by Gustavus Adolphus, of Sweden, eighty-nine years before the province of Livonia became, by the treaty of Nystadt, a part of the Russian Empire, (whereupon, instead of being developed and strengthened, it was actually suppressed and not again restored until the opening of the reign of Nicholas in 1802;) while the Finnish University, long at Abo, where it was founded in 1640, but now located at Helsingfors, was also of Swedish origin. The other four, to wit, those of Kasan, founded 1803, Kharkov, 1803, St. Petersburg, 1819, and Kiev, 1833, are of quite recent origin.

The general features of the Russian universities are essentially German, and much of the instruction in them is given by German professors. With two exceptions, however, they are without theological faculties; and the German faculty of philosophy, which embraces all general studies outside of the professional faculties, is, in most cases, divided into two distinct faculties—the historico-philological and the physico-mathematical, and sometimes three oriental languages being the third. The instructors are ordinary and extraordinary professors and private docents, though bearing different names, and in some unimportant respects sustaining slightly different relations. They are generally paid rather higher salaries than in the German and Scandinavian States, 2,666 rubles, ($2,009,) though considered a high salary, not being very uncommon. The fees demanded of students are, in all cases, very moderate, much the larger part of the cost of maintenance being supplied by the government.

The most numerously attended and munificently supported of the Russian universities is that of Moscow, whose faculties are represented by a total of 120 professors and other teachers, including many men of much learning and great distinction, and the students in attendance upon which have sometimes numbered over 1,700. It is well provided with the usual facilities in the way of libraries, collections, &c., and is exerting a powerful influence upon the intellectual culture of the empire.

The University of St Petersburg ranks next in importance. Though more than once it has suffered from the caprice and arbitrary power of a former sovereign, it is now, under the fostering care of the present Emperor, in a pretty good condition. It occupies plain but extensive and commodious buildings on the Neva, and at Neoska, near by, where the medical faculty is located, that its large number of medical students

may have convenient access to the great hospitals in that portion of the city. Besides the four faculties common to the Russian universities, it includes also a school of oriental languages. The instruction is given by 74 professors and teachers, of whom 15 belong to the historico-philological faculty, 28 to the physico-mathematical faculty, 12 to the juridical faculty, and 19 to the faculty of medicine and surgery. During the summer semester of 1867 there were 694 students in attendance—the total for the year is sometimes 1,200—distributed by faculties as follows: in the faculty of history and philology, 56; in the law faculty, 23; in the faculty of physical and mathematical sciences, 138; in the faculty of medicine and surgery, 477.

The ordinary professors receive a salary of 3,000 rubles, (of 75 cents;) extraordinary professors, 2,000 rubles; docents, about 1,200. Students pay 50 rubles per annum.

The scientific establishments belonging to the university, including laboratories, museums, and collections, are only fair in extent and quality, and the library contains 80,000 volumes.

The amount received from the state for the support of the institution, as given me by the secretary, is 280,000 rubles per annum, including 50,000 rubles given in aid of poor students.

Kasan is distinguished by its division or school of Asiatic languages, said to be more extensive and complete than that of any other university in the world. Number of university professors and docents, 76; of students, about 400.

The universities of Kharkov and Kiev, both founded by Alexander I in 1803, and since provided with many important scientific auxiliaries, besides valuable libraries, are liberally sustained by government and people; the first-named having 80 instructors and 500 students, the last 100 professors and other teachers, and about 1,000 students.

Dorpat possesses a theological faculty next in rank and importance to the great theological institute at Moscow, but is more particularly noted for the world-wide honours won by its physico-mathematical faculty, or rather, by its astronomical observatory, first made famous by Tycho Brahe, and since well maintained in its high rank by Struve and other eminent astronomers. Its library comprises 75,000 volumes, and it numbers about 90 teachers and 600 students.

The University of Finland, at Helsingfors, although now embraced within a grand-duchy of the Russian Empire, and not only established where it now is, but also supported by the Russian government, is, nevertheless, to all intents a *Finnish* institution; on which account—because Finland is usually thought of, and had been previously thought of by myself, as a polar country, quite beyond the reach of educational instrumentalities, and certainly of superior institutions of learning—as well as on account of its really very respectable character and prosperous condition, my inspection of its several departments was fruitful of more surprise and pleasure than were afforded me by almost any other university of Northern Europe.

The destruction of its ancient buildings and library, in 1827, at Abo, where it was formerly located, necessarily rendered its re-establishment at Helsingfors, the new capital, the equivalent, in all material respects, of a new creation. Still, in organization it has preserved the mixed German and English element, as first adopted by its Swedish founder, being governed by a chancellor, (which office is filled by the Emperor Alexander himself,) an immediate representative of the Emperor, *(jeust fö ratlande Kansler;* the incumbent *ex officio* being the imperial minister and secretary of state for Finland,) a vice-chancellor, a rector, and pro-rector, and a consistory composed of the rector and twelve professors. The faculties are theological, juridical, medical, and philosophical; theology being taught by 4 professors, law by 5, medicine by 6 professors, with a prosector and 2 docents; and philosophy by 18 ordinary professors, 1 extraordinary professor, 6 readers, and 14 docents; besides which, there are 5 masters of exercise, *(Exercitie-Mästare,)* such as music, drawing, gymnastics, &c.; the total number of teachers thus being 61.

As in all the universities of the far north, the instructional force in the several professional faculties is small; but it will be observed that—what is of really more importance, as showing the presence, in this hyperborean land, of that *wissenschaftlichen Geist* of which Germany is the great nursery, and without which no nation may hope for the highest intellectual development—the faculty of philosophy, with its corps of 39 learned teachers, has a truly German look, and furnishes the most gratifying evidence of at least a learned class among the Finns. This evidence is corroborated, moreover, by the existence of as fine an array of libraries, museums, cabinets, laboratories, and the like, as is usually found in the more famous universities of Middle Europe. Notwithstanding the destruction of its former library of 40,000 volumes at Abo, in 1827, as above mentioned, its present accumulations amount to over 100,000 volumes, representing every department of literature; while among its scientific establishments and collections there are: a large and handsome and well-equipped astronomical observatory; a magnetic observatory; a cabinet of physical instruments; new and excellent chemical and pharmaceutical laboratories; valuable collections in natural history, including a most interesting display of Finnish birds and minerals; a botanical garden; a museum of coins, medals, and works of art; an ethnographical museum; a musical oratorium; a physical gymnasium; a riding-school, &c. The university has, also, connected with it a printing and book-publishing establishment, from which are issued many valuable works in the Finnish, Russian, and Swedish languages, and a general pharmaceutical and apothecary establishment, the last named being under the management of the medical faculty. Nor does this enumeration complete the report of what this vigorous and progressive university is doing to advance the interests of science and learning in Finland. Its scope has just been enlarged by the incor-

poration with it of a polytechnic department, as already stated under another head, that promises at an early day to rank among the best schools of science and the arts in Northern Europe. The magnificent new building—between 200 and 300 feet long, and three stories high—was nearly completed when I saw it, (June, 1867,) and, ere this, the polytechnicum must have been organized and put in successful operation.

The interest felt in this university by the government is further manifested by the annual appropriation of 450,000 marks (of 20 cents each, or $90,000) in aid of its support. In consequence of this generous encouragement, it is enabled to pay the professors very fair salaries—6,000 to 10,000 marks—with but moderate fees from students, of whom the number in attendance is 474, viz: 51 in the theological faculty, 128 in the law faculty, 28 in the faculty of medicine, 147 in the historico-philological section of the philosophical faculty, and 120 in the physico-mathematical section.

The term of study in each of the faculties is four years, and the degrees conferred are those of candidate, (as in Belgium,) master, and doctor.

UNIVERSITY EDUCATION IN AMERICA.

It has been said, both at home and abroad, that there are no real universities in America. And if we allow that the German ideal, which is unquestionably the highest at present recognized by any considerable portion of the educational world, be the true one, then it must be acknowledged that this somewhat humiliating statement is true; nay more, that it falls quite short of the whole truth, a full expression of which would be that there is really nowhere, whether in the New or in the Old World, a real university outside of Germany. For, so far as the so-called universities of all other countries are concerned, it will appear from the foregoing review, either that they are something quite different, as is the case with those of England, for example, or that, being patterned after the universities of Germany as a model, they fall far below them in the most important particulars; while, of those of America it may be truthfully affirmed that they are both different and inferior—different, I mean, from the best German models, and also, with two or three exceptions, inferior to the English models after which our institutions of the superior class are chiefly fashioned.

In South America there are at present no institutions bearing the name of university, nor is there one now known by any other name to which the title of university could be properly applied. At Santiago, in Chili, there is a "National Institute," embracing a high school department, together with faculties of law and medicine, but it is now in no sense a university, nor does it seem to be the fixed purpose of the government to give it a university development. And in Brazil, which, educationally, is the farthest advanced of the South American States, as I have had occasion

to show in preceding chapters, although there is a fully formed project to establish a great national university like those of Berlin and Vienna, but little has yet been accomplished. I know of no other South American State that deserves special mention in this connection.

The Canadian universities are all of the British type, and naturally as inferior in rank and importance as they are in wealth and years to those of the mother country. The most important institutions are the Laval University at Quebec, with faculties of arts, law, and medicine, and a theological school, none of which are either properly supplied with professors, or numerously attended by students, however—and the University at Toronto. The last-named has an endowment of 225,000 acres of the public lands, with an unusual array of fine buildings, erected at an aggregate cost of over $300,000, and promises, at a day not far distant, to become a university in fact as well as in name. It embraces in its plan faculties of arts, medicine, and law, together with schools of engineering and of agriculture. There are, besides these nominal universities, several colleges in both Upper and Lower Canada possessing university powers, but yet being in no sense universities. The degrees conferred by the Canadian institutions are essentially English, although the more "scientific" tendencies now characterizing the institutions of the United States are beginning to manifest themselves.

In the United States the condition of university education is not very materially different. The number of institutions bearing the title of university is much larger than in any other country, and a less number of them have really any sort of claim to it. But, on the other hand, there are a few institutions—three or four of them originally established as colleges, and still modestly preserving that title, and an equal or less number more recently chartered as universities—the number of whose faculties, the high quality of whose aims, and the distinguished character of whose officers and professors entitle them to respectful consideration in this general survey.

HARVARD COLLEGE.

Pre-eminent among the colleges possessed of university characteristics are Harvard College, at Cambridge, Massachusetts; Yale College, at New Haven, Connecticut; and Columbia College, at New York. The first named dates back to 1636, and is the oldest institution of learning in America. From the small beginning then made with the object of preparing young men for the work of preaching and of teaching in the public schools, it has slowly developed by the formation of professional schools and the expansion of its academic department, until it now presents at least the semblance of what the Germans understand by a *full* university, the number of whose faculties, it will be remembered, must not be less than four, including those of theology, law, and medicine, embracing as it does:

1. An academical department, including regular courses in religion,

philosophy, rhetoric and oratory, history; modern languages, Latin, Greek, Hebrew, natural history, anatomy and physiology, chemistry and mineralogy, physics and mathematics, with 28 professors and instructors, and about 500 students.

2. A divinity school, (liberal,) with 3 professors and 19 students.

3. A law school, with 3 professors and 138 students.

4. A medical school, with 11 professors and assistants and 308 students.

5. The Lawrence Scientific School and School of Mining and Practical Geology, with 7 professors, most of whom also give instruction in the academical department, and 41 students.

6. A special school of astronomy, with 2 professors and 3 students.

7. A museum of comparative zoology, with special lectures by 4 professors; and

8. A dental school, with 7 professors, some of whom are also members of the medical faculty.

A further addition to this array of distinct schools is about to be made, if, indeed, it has not already been concluded, by the connection with the college of an "Episcopal Theological School," the management of which is to be practically with the Protestant Episcopal Church, but whose professors and pupils are to have access to the libraries, museums, and lectures of the college. And there has, of late, been organized a series of courses of lectures on various subjects, open to all graduates of colleges, to public school teachers, to persons connected with the college, except undergraduates, and to others on the payment of a certain fee. These courses are collectively known as "university lectures," and it is the design that they shall eventually constitute a high faculty of philosophy.

The material auxiliaries consist of general and special libraries, comprising about 150,000 volumes; chemical and physical laboratories; the museum of comparative zoology, destined, under the administration of its distinguished director, Professor Louis Agassiz, to become one of the most extensive and important collections in the world; valuable mineralogical and botanical collections, and a well furnished astronomical observatory.

The external administration of Harvard College is vested in two separate boards; the first, known as "the corporation," and consisting of the president, five fellows, and the treasurer, with power to supply all vacancies in its own body, as well as to nominate professors and other instructors, subordinate officers, &c.; the second, a board of "overseers," composed of the president and treasurer, *ex officio*, and thirty members, chosen by the legislature after a method that requires the dropping out of five members and the election of their successors annually, and clothed with general administrative powers, some of which are exercised independently, and others in conjunction with the corporation.

The endowment of the college consists of such funds and other property, personal and real, as have been bequeathed to it by numerous individuals, societies, and corporations during the past two hundred and thirty-

two years; the present total valuation, independent of the college grounds, buildings, libraries, and collections, being something over $2,000,000. The total income from all sources, including tuition fees, the past year, was about $180,000, full half of which, however, has to be credited to funds which are not available for general purposes, owing to the special direction given to them by the donors.

If now we turn our attention to the condition of the institution, educationally, we shall find the academical department doing the general work of the German gymnasium. In the mathematics, as well as in the physical and natural sciences, it accomplishes a little more; but, on the other hand, in the ancient and modern languages the course of study is quite inferior, so that the most proficient bachelor of arts leaving Harvard would hardly be prepared to enter any of the great universities of Europe. It is, in fact, nothing but a preparatory school as compared with a proper faculty of philosophy. It is supplemented in a certain way, it is true, by the Lawrence Scientific School; but this supplementation is more in appearance than in reality, since the school in question has no essential connection with the department, to which it stands rather in the relation of a scientific rival, offering several brief, independent, and, for the most part, professional courses of instruction to the most meagerly qualified students, and sending them out with titles in no way expressive of their real attainments. In speaking thus I must not be understood as disparaging either the praiseworthy aims of the noble founders of this scientific school, the indisputably high character of the distinguished men who give the instruction, or the useful office fulfilled by institutions of this class, but rather as making an impartial comparison of it with the highest existing standards. A school of science, with departments of chemistry, of zoology and geology, of engineering, of botany, of comparative anatomy and physiology, of mathematics, and of mineralogy, each in charge of the very ablest professors, and furnished with excellent means of illustration and experiment, could hardly fail of accomplishing great good, even though, as in the Lawrence School, the qualifications for admission should simply be a good moral character, and "a good common English education," and the term of study "at least one year." But that is not the question. The point not to be overlooked is this, namely: That the foremost of our American universities presents nothing in the way of a general foundation for professional studies at all comparable with the philosophical faculty of the European university.

The professional schools present a picture scarcely more encouraging; for although they rank higher in some respects than many others of their class in this country, and are conducted by men of great ability and distinction, they are, nevertheless, sadly deficient in the number of their professors; their libraries are deficient; their standards of admission, as to preparatory education, are exceedingly low; the periods of study are quite too short; and the charges for tuition so high ($75 to $200 per annum) as practically to exclude many worthy young men who ought to

be able to, and who otherwise would, attend. This last objection is met, to some extent, especially in the divinity school, by bursaries in small number. The term of study in the law school is two years; in the divinity school, three; and candidates for the degree of doctor of medicine must have studied three years with a preceptor and attended two courses of lectures.

YALE COLLEGE.

Yale College, though sixty-four years later in getting established, had a similar origin and has had a like career. It embraces—

1. An academical department, with 17 professors and 519 students.

2. A department of philosophy and the arts, with 22 professors, (several of them also engaged in the first-named department,) and 140 students.

3. A school of the fine arts, (not yet fully organized, but assuming form.)

4. A theological department, with 8 professors and 25 students.

5. A law department, with 2 professors and 17 students.

6. A medical department, with 9 professors and 23 students.

The college possesses libraries, with a total of 81,000 volumes, valuable collections in geology, mineralogy, botany, and zoology, excellent chemical laboratories, an observatory, &c.

The total amount of funds at present available for the support of the college in all its departments is something over $1,000,000. Of this sum, $291,446 is a general fund, the income of which may be used for any collegiate purpose; and the remainder, including $135,000 derived from the sale of agricultural college scrip, consists of special funds designed by the donors for the support of particular departments, professorships, scholarships, &c. Besides which, there are "accumulating funds" to the amount of $181,703, the income of which is, for a time, to be added to the principal, and recent donations for building purposes to the amount of $140,360.

As an institution of learning, Yale differs from Harvard chiefly in the constitution of its department of philosophy and the arts. This department was formally instituted in 1847, with the view of providing advanced courses of study for graduates and others, whose requirements were not already met in the then existing professional schools. The aim was in fact a philosophical faculty analogous to those in the German universities, and for a time this idea was kept prominent; but since the date of its organization, the demand for instruction in the applications of the material sciences to the useful arts has been so great that the organization of a distinct scientific school, though still subordinate to the department, became necessary; since which date the more literary side has practically had less relative importance. At present this school of science, known as the Sheffield Scientific School, embraces seven distinct courses of study, to wit: 1, chemistry and mineralogy; 2, civil engineer-

ing; 3, mechanical engineering; 4, mining and metallurgy; 5, agriculture; 6, natural history and geology; 7, select course in science and literature.

Candidates for admission must be not less than sixteen years of age and undergo a twofold examination: 1st, in mathematical studies, including arithmetic, algebra, geometry, and plane trigonometry; 2d, in the elementary literary studies, including English grammar, history of the United States, geography, Latin grammar, and in the first six books of Virgil or some equivalent author. The charge for tuition is $125 a year, and special students of chemistry are required to pay $75 extra for chemicals and use of apparatus.

The term of study in each of the courses is three years; the studies of the first year being introductory in their character and common to all. The degree conferred on the student who satisfactorily completes any one of these courses is that of bachelor of philosophy. The degree of civil engineer is also conferred on students of a higher course in engineering (occupying one year) who have sustained the final examination and given evidence of their ability to design important constructions and make the necessary drawings and calculations. The second section of the department of philosophy and the arts provides advanced courses in: 1st, philosophy and history, including political philosophy and international law; psychology, logic and history of philosophy; history and criticism of English literature and history; 2d, philology, embracing Latin and Greek languages and literatures; general philology, ethnology, and oriental languages, and modern European languages; and, 3d, mathematics, including pure and mixed mathematics and astronomy.

Candidates for admission must either present the diploma of bachelor, (of arts, science, or philosophy,) or pass an examination in studies properly preparatory, equivalent to that required for admission to the Scientific School. The term of study requisite to a final examination for the degree of bachelor of philosophy is two years. The degree of doctor of philosophy is also conferred on such persons as, having already obtained the degree of bachelor, continue a course of higher studies under the direction of the faculty for the further period of two full academic years, and pass a satisfactory final examination, and present and defend an acceptable thesis. It is also required that, in case the bachelor's degree possessed by the candidate for the doctorate should be such as not necessarily to imply a knowledge of Latin and Greek, he shall pass a satisfactory examination in these languages, "or in such other studies, not included in their advanced course, as shall be accepted as an equivalent by the faculty." The price of tuition in this section is about $100 per annum.

As to the professional departments of Yale College, it is worthy of remark, that the degree of bachelor of divinity is conferred only upon bachelors of arts who have satisfactorily completed a three-years' course of theological study; that the degree of bachelor of laws is conferred on

"liberally educated" students after eighteen months' study in the law department, and to students not liberally educated, after two years of study, no preparatory study or preliminary examination being requisite to admission in any case; and that two to three years of study, including two courses of medical lectures, are the conditions of admission to the degree of doctor of medicine.

The totals of the charges for tuition and the diploma in each of the professional faculties are as follows: In the divinity school, no charge is made for instruction; room rent is also free; and the only charge is \$5 per annum for incidentals. Total of fees in the medical school for the two courses and diploma, \$240; in the law school, \$155.

COLUMBIA COLLEGE.

Columbia College was chartered in 1754, from which time until 1784 it was known as King's College, afterward as a university until 1787; at which date the name was changed to the present. Quite early in its history it was the recipient of numerous donations of land and money, which, together with those subsequently made, have reached an aggregate value of but little less than \$2,000,000. It has been the desire of the board of trustees to give it a university character by the gradual development of a faculty of philosophy above the academical department, and the incorporation of such professional faculties of a high order as should seem to be most urgently demanded by the country and times. At present, however, it embraces only the following:

1. A school of letters and science, with a four-years' course of study equivalent to the ordinary college course of the country, a faculty of 12 professors and other instructors, and an average attendance of 150 students.

2. A school of mines, with a three-years' course of instruction, given by 14 professors and assistants, (three of whom are also members of the faculty of arts,) and attended by about 100 students.

3. A school of law, with a two-years' course of study, a corps of 4 regular professors, and 4 special lecturers, and an average of 180 students; and,

4. A school of medicine, (the College of Physicians and Surgeons of the City of New York, with which, however, the present connection is maintained only during the pleasure of the respective boards of trustees of the two colleges,) in which the instruction is given by 12 professors, aided by 7 assistants, and upon which there is an attendance of nearly 500 students.

The charges for tuition in the several departments are as follows: In the academical department, \$100 per annum; in the school of mines, \$160; in the law school, \$100; in the school of medicine, about \$100 for each term of lectures. Several societies and municipal corporations are entitled to from two to four free scholarships; every religious denomination in the city of New York is entitled always to have one student,

who may be designed for the ministry, in the college free of all charges for tuition; and finally, every school from which there shall be admitted four matriculants in any year is allowed to send one pupil free of charge.

OTHER UNIVERSITY ORGANIZATIONS IN THE UNITED STATES.

Of organizations in the United States styling themselves universities, there are nearly one hundred. They are of three general classes, to wit:

1. Denominational universities, founded and managed by religious sects.

2. Non-sectarian universities, which, though in the main independent, are partly endowed and controlled by the State; and,

3. Universities originally founded and wholly controlled by the State.

The number of the universities of the first class is already some threescore, and every year others of new creation are added to the list. A few of them have long, and very justly, held an honorable rank among the collegiate institutions of the country; but not one of them has, as yet, established any sort of claim to the title of university, while, of the large majority, one finds it somewhat difficult to make mention in such a connection in other terms than those of reprobation and contempt.

Universities of the second class named find notable illustrations in Kentucky University, and in Cornell University; each of which owes its existence and its magnificent beginnings of endowment to the labors and princely liberality of a single citizen.

Kentucky University, lately removed from Harrodsburg to Ashland, in the vicinity of Lexington, and through the efforts of Mr. John B. Bowman, its originator and present practical head, greatly enlarged by the consolidation therewith of Transylvania University, and the new College of Agriculture and the Mechanic Arts, endowed by the act of Congress of July 2, 1862, by liberal appropriations from the State treasury, and by donations from individual citizens to the amount of nearly a quarter of a million dollars, may properly date from 1865. And yet, thus soon, it embraces four departments in vigorous operation, namely: an academical department, a college of arts, a law faculty, and a school of divinity, with a total of twenty-five professors and other teachers, and a large number of students. The plan also includes an agricultural and mechanical college, a normal college, and a college of medicine; for the early opening of all of which measures are in progress. The government is vested in a board of curators, consisting of not less than thirty of the donors, and is practically exercised by the executive, who is styled "regent," and a small executive committee. The College of Agriculture is subject to visitation from a board of six visitors, appointed by the governor with the advice and consent of the senate.

Cornell University, located at Ithaca, New York, very properly bears the name of its munificent originator, Mr. Ezra Cornell, whose constantly augmenting donations already amount to nearly or quite $1,000,000, and

through whose personal efforts it secured the 990,000 acres of land granted to the State by Congress for the endowment of a college of agriculture and the mechanic arts. The plan of the institution, as presented in the organic act, is a broad and liberal one, with a very special recognition of the claims of the industrial arts. Distinguished scholars, some of them long and honorably connected with European universities, are being secured for important professorships, and no means are to be spared necessary to make it an institution worthy of the State and of the country.

Universities of the third general class are divisible into three special classes. Of the first there is but one example, the University of the State of New York. This anomalous organization was created during the administration of Governor George Clinton, in 1787. It has no visible existence other than in a board of regents clothed with certain supervisory powers, suggestive of the old University of France and the more modern University of London—the only others of either the past or present time to which it bears much resemblance. And yet it is quite different from both of these, for the University of France was a council of management, holding absolute power over every class of schools of the empire; and the University of London is barely an authorized board of examiners, determining the qualifications of such aspirants for literary honors as may come to it for sanction, whether from private study or from the many institutions whose pupils look to it for their degrees; while the University of the State of New York confers none but honorary degrees, and is limited in its supervision to certain colleges and academies—over two hundred in number—to which it apportions the annual income of "the literature fund," and from whose officers it is authorized to require annual reports, itself, in turn, reporting its own transactions to the legislature.

A second division may embrace universities whose declared purpose it is to become, not representatives of universal culture and knowledge, but of the sum total of knowledge of a particular class, directed to special ends. Of institutions of this sort, *i. e.*, organized for partial purposes, and yet styling themselves universities, we have but two examples—the Industrial University of Illinois, just organized, and the Normal University of Illinois. The first of these is, in fact, a polytechnic school with an academic department, in which there is a leaning to the scientific rather than to the classic side—in other words, a college of agriculture and the mechanic arts of the peculiar character outlined in the congressional act of 1862, already referred to. It is endowed with over $400,000 in lands, buildings, and bonds, chiefly donated by the citizens of Champaigne County, where located, besides 480,000 acres of public lands from the congressional grant. The Normal University, located at Normal, is neither more nor less than a high normal school, and has no better claim to the title of university than Bologna had when it was simply a school of law.

In the third division of our State universities I include all institutions incorporated as such, without limitation, by title, to any partial field of learning, and which, unlike the University of New York, are designed to furnish within themselves the means of the higher culture. The oldest of these—the University of North Carolina—dates back to 1789; the South Carolina University, to 1801; the Ohio University, to 1804; and the University of Virginia, founded through the instrumentality of Thomas Jefferson, and molded by his hand, to 1819; but the larger number are of quite recent origin, and for the most part belong to the Mississippi Valley. Those of Indiana, Alabama, Michigan, Missouri, Wisconsin, Mississippi, and Iowa, (naming them in the order of foundation,) have been in actual operation for some years; but others, including those of Minnesota, Kansas, and California, are only just now taking form; while yet others, to be established in the newest States, under the stimulus of that wise and liberal policy of the national government which sets apart a portion of the public domain for this purpose in all the incoming States, have, as yet, only a nominal existence.

The older institutions of this division were generally fashioned after the English models; while the more recent ones are undergoing such changes, by the incorporation of the new schools of science, and of the industrial and the fine arts, as will distinguish them from such, and, indeed, from most other foreign models. All are governed by trustees or regents of state appointment, (executive in some and legislative in others,) and the administrative head is known as chancellor, rector, or president. Being strictly state institutions, and there being in this country no state church, they are constitutionally free from denominational control, and the charter of one of them (the university of the State of Missouri) even prohibits the appointment of a clergyman to the office of president or professor. Several provide for free scholarships in considerable number, and the design is that in nearly, if not all, tuition shall be ultimately free.

At the present moment some of them consist merely of the ordinary school of literature, science, and the arts, and others also embrace one or more professional schools, which, however, I am sorry to say, are, in general, of a rather inferior grade.

At the head of this new cluster of incipient universities, and prominent also among the foremost superior institutions of the whole country, stands the University of Michigan, organized in 1837. By a careful management of the congressional grant of lands, seconded and encouraged by State and municipal liberality, the endowment of this institution has been made to yield an income of nearly $60,000.

The departments already in operation are three: 1. The department of science, literature, and the arts. 2. The department of medicine and surgery; and, 3. The department of law.

The first-named department is devoted to general instruction and discipline, and the studies prescribed are so arranged as to constitute a four

years' classical course, corresponding to the undergraduate course in the best American colleges; a four years' scientific course, in which more attention is given to the English, French, and German languages and literatures, and to the mathematical, physical, and natural sciences, and from which the classics are omitted; a four years' course in civil engineering, in part identical with the general scientific course, but concluding with professional studies; and, finally, shorter courses in mining, engineering, and in analytical chemistry. Excellent working chemical laboratories are in operation. Valuable collections in natural history and in the fine arts have already been formed, and the astronomical observatory is fast becoming one of the most distinguished in the country.

The degrees conferred in this general department are those of bachelor of science, bachelor of arts, civil engineer, and mining engineer. The degrees of master of arts and master of science are conferred upon bachelors who devote one year's additional study to appropriate branches chosen from programmes designated by the faculty, as well as upon graduates of three years' standing who have engaged during that period in professional, literary, or scientific studies.

The instruction in this department is given by the president and 18 professors, and the number of students ranges between 350 and 500.

The department of law is well organized, in accordance with the American idea of legal education, and is more largely patronized than any other law school in the United States. No particular educational qualifications are requisite for admission. The course of study is continued through a period of two years, with one term in each year, commencing on the 1st of October and ending with the last week of March; the number of lectures and examinations being ten each week. The instruction is given by four professors, judges of the supreme court of the State, and the attendance is nearly 400.

The medical department of the University of Michigan possesses more than ordinary interest on account of its higher standard of admission than is common in this country, and because of the illustration it affords of the practicability of sustaining a great and flourishing medical school in a country town of but moderate population. The conditions of admission are: "a good moral and intellectual character; a good English education, including a proper knowledge of the English language and a respectable acquaintance with its literature and with the art of composition; a fair knowledge of the natural sciences, and at least of the more elementary mathematics, including the chief elements of algebra and geometry, and such a knowledge of the Latin language as will enable the candidate to read current prescriptions and appreciate the technical language of the natural sciences and of medicine." The degree of doctor of medicine is conferred upon the usual conditions. The number of professors is 11; of students, between 400 and 500.

Tuition in all the departments of the university, general and professional, is *free;* the only charges made being a matriculation fee of $10,

(of $20 for students from without the State,) and $5 per student for incidental expenses.

Michigan has certainly made a noble beginning and one worthy the emulation of the other States upon which like endowments have been conferred. But it is only a beginning after all. Students cannot make a great university, though they throng the halls of an institution by thousands. It is rather by its multitude of learned professors covering the whole field of human knowledge and furnished with every needed material aid to the instruction they offer, that the university is to be known. And these only can be had where there is that appreciation of their necessity that leads to resolute and irrepressible effort to secure them. More income is still the crying need of Harvard, Yale, Columbia, and Michigan. And if this be true of these, the foremost of our superior institutions, what shall be said of that swarm of petty academies that wear the title and do the honors of the university in scores of our country villages, with from three to ten professors each, and endowments varying from $20,000 to $100,000 all told?

In view of this poverty of even the best endowed of our American universities, we may make the most generous concessions of high purposes and practical wisdom to those who direct them, and yet find ample reasons for their actually low educational condition in every department. They who are responsible for their management doubtless lament this low condition, but it is none the less impossible for them to make seventy to one hundred thousand dollars at Cambridge, New Haven, New York, or Ann Arbor, do the work of three times that amount at Vienna or Berlin. When, therefore, we confess that the academical department of the oldest and the most advanced of our American universities is entitled to rank scarcely higher than the German gymnasium, whose certificate is essential to admission to the central and foundation faculty of the German university; that the average graduate, fresh from some of our most noted scientific schools, could hardly pass the entrance examination at any of the European polytechnicums; and that the terms of admission to all our university professional schools, and the meagerness of the courses of study prescribed, as requisite to the degrees they confer, are justly a reproach to the intelligence of our people and a laughing-stock with those who understand them in the Old World, it should be with feelings of profound sympathy for the many self-sacrificing scholars of America who are struggling to insure to their respective institutions, and to American superior education, a more honorable career. The reproach is chiefly with the governments and the people who refuse the necessary means.

And yet, after all, the question will sometimes arise and even repeat itself—and occasionally with a little impatience—whether the cause of the higher culture and the interests of education generally would not be better promoted by raising the standards of admission and graduation quite above the present low level; thus putting all truly preparatory

work upon the high schools, academies, and colleges, where it properly belongs, and employing the whole instructional force of the university in attempts to meet that growing demand for instruction in the higher departments of learning at present nowhere supplied but in Europe. The adoption of such a policy might, at first, reduce the number of students, and even require a concentration of means upon a less number of professional schools. But it seems to me certain, that the loss in numbers would be more than made up in both cases by the higher quality of the work done, and that the reputation of the institution that should be true enough and brave enough to make the trial, would be so enhanced thereby as to eventually, and at a period not remote, win to it, not only more students than formerly, but also liberal benefactions, now either withheld or divided among the many institutions of common desert, whose clamor for help is heard in every quarter. A preparatory department, paving the way to a university academic department, which, of itself, is nothing more than a preparatory school to a really respectable university, and employing the forces and means needed for true university work upon mere boys, who ought to be in the common school, is a disgrace to any institution either claiming, or aspiring to, the title of university. It is time that the managers of all our higher institutions should rise so far above pandering to the popular custom of judging of the success of a school by the number of pupils, without regard to quality or condition, as to shut their doors in the faces of all pupils not qualified to enter at once upon the study of such subjects as properly belong to institutions of that grade. A state university pursuing this course would at once create a demand for more and better training in the colleges and high schools; the high schools, in turn, would exert a like influence upon the schools below them; and thus the whole system of schools in the state would be vitalized and raised to a higher level. One thing is certain, such a central institution cannot exist and not exert an influence. It rests with those who shape its policy to determine whether that influence shall be one of repression and degradation, or of stimulation and exaltation.

But our so-called universities in this country are no less faulty in the brevity of their courses of study. They have become so imbued with the rushing, headlong spirit of the times, that they have ceased to insist on thorough and complete work. They might properly enough place over their doorways this inscription: "Scholars made to order on short notice." It may be necessary for them to open their lecture rooms, libraries, museums, and laboratories to many who, for various reasons, cannot remain long enough to complete a thorough course of study. But then the few who do want such a course are just as much entitled to it as are the many to the partial privileges they demand. Why should not all be accommodated? But whatever else is done, or not done, this must be borne in mind, namely, that *the primary end of the university is the higher culture.*

Let the door be open to him as an auditor who would know a little more of many things, or a good deal more of some one thing, than he now knows; but let him alone become a member of the university and the recipient of its honors who is willing to earn them.

The degrees conferred by our universities are substantially the same, it will have been observed, as those conferred by European institutions, though the attainments they represent are, of course, as much less in amount as the institutions themselves are inferior. That the educational institutions of a new country like ours, in which grand material enterprises first press upon almost the whole population with the weight of a necessity, should be slow in attaining the ideal standard, in so far as their progress is determined by the abundance of pecuniary means, is hardly surprising; but that the honors, which, at the world's centers of learning, attach to fixed minima of intellectual culture and knowledge, should be so far degraded as they are in this country, merely to gratify the overweening pride of the half-cultured majority who annually go out from our universities with the highest titles it is in the power of the best institution in the world to confer—this is wholly without reason or excuse. Men of the profoundest and highest culture we have in America, it is true—men whose scholarship, no less than their native genius, adds luster to their country, and to the letters and science of the age—men worthy of the highest honors that can be accorded them by authority of the state—but the honors actually conferred by our universities are by no means confined to this, as yet very small, class of American scholars. Every year our multitude of petty colleges known by the high-sounding title of university, but really able to furnish nothing more than the mere rudiments of learning, send out their swarms of bachelors and masters, and with a most profuse hand distribute even the highest honorary doctorates to men, scarcely one in one hundred of whom is possessed of either the culture or knowledge represented by the German "certificate of maturity." The explanation of this worse than absurd practice, this outrage upon the cause of the higher education, is found partly in the gross ignorance of boards of management, which often renders it impossible for them to conceive of, much less to appreciate, a true standard of high culture, and partly in the poverty of the institutions they represent, by reason of which, in the absence of anything like the *wissenschaftliche Geist* of the continental universities, they are controlled by the sordid motive of helping their pecuniary fortunes.

It ought to be established as a principle, in the incorporation of all classes of educational institutions, that the degrees authorized should in no case represent a higher culture than is fairly represented by the institution itself. And then, if there could be no actual conferring of honorary degrees of any sort without the concurrence of the faculties themselves, the present evil would be so far corrected that educational titles would cease to be a laughing stock among all truly educated men, and again

become reliable evidence of scholarship and the honored badges of the most solid merit.

Thus far the remedy for the contempt, in which our higher—even our highest—institutions of learning in this country are held at the world's educational centers, is clearly in the hands of the institutions themselves. But it is not enough that our too pretentious schools and universities be brought to a true and honest dealing with the public; their poverty of means, which, without a single exception, stands as a barrier in the way of their promptly rising to the European level, lies at the root of the whole matter. This can only be overcome by the will of the people, manifesting itself, either in individual benefactions or in more liberal donations and appropriations made by the State and national governments. We seem, as yet, to have, in America, no just judgment as to the means requisite to the endowment and maintenance of a first-class institution of learning of any sort. And the result is that our colleges, professional schools, and would-be universities are left to the alternative of maintaining a beggarly and sickly existence on foundations less in the total amount than the annual income of many a university in the Old World, or of dying out altogether.

The government of the United States has done so nobly in the matter of donating lands for the endowment of common schools, and for the aid of scientific and collegiate institutions, that the State governments and the people have fallen into the serious error of supposing that nothing more is needed to insure their success; whereas the truth is, there is not so much as one institution of the higher class in the whole land whose income is half equal to the demands made upon it, or even to the work it actually assumes to do. Harvard is foremost in this regard, its available annual income being, as we have seen, a little over $100,000; and yet its president, professors, and managers are painfully conscious of its deficiencies in every department. If the income were even two or three times as great as at present, this institution—at least if developed on the present plan—could then only approximate the efficiency and greatness of some of the European universities.

Again, I say we must not allow ourselves to be deceived by outside appearances, and so take to ourselves the flattering unction that university education in America is in a highly creditable and prosperous condition, while there is, in fact, no such thing among us. The imposing array of distinct departments presented by a few of our so-called universities and university colleges, and their voluminous catalogues of students are gratifying evidence of the intellectual activity of our people, of a growing appreciation of the equal rights of all classes to the means of acquiring a knowledge of the principles that underlie their respective pursuits in life; but they afford little ground for judging of the amount of the higher culture to be had in the schools of the country, for the reason already hinted at, namely, the low standard of admission and the brevity of the professional courses of instruction.

Harvard and Yale may boast of a thousand students each, and the University of Michigan, most numerously attended of all the institutions of learning in this country, may have upon its annual catalogue twelve to fifteen hundred names; but, if the best cultured of these several hundreds rank no higher than the advanced pupils in a German gymnasium or a French *lycée*, while three-fourths or four-fifths of the whole number are gathered up by the schools of law and medicine from among the most uncultured young men of the country, given a superficial view of their respective fields of study, and then sent out to further degrade the standard of those professions, where is the credit?

To tell the plain truth, the very best of our many universities are but sorry skeletons of the well-developed and shapely institutions they ought to be, and must become before they will be fairly entitled to rank among the foremost universities of even this present day. And if we are not content always to suffer the contempt of European scholars, who properly enough regard us as a very clever, but also a very uncultured, people, it is time that all true lovers of learning, as well as all who desire the highest prosperity and glory of our common country, should awake to the importance of at once providing the means of a profounder, broader, and higher culture in every department of human learning.

Let us have, without further delay, at least one real university on the American Continent. And if no one of the individual States, aided by the beneficence of friends of learning throughout the country, is equal to the great work of building up such an institution, then let the national government again extend its helping hand and meet this greatest present need of American education.

CHAPTER XIII.

LEADING TENDENCIES OF UNIVERSITY EDUCATION.

MODIFICATIONS OF UNIVERSITY EDUCATION—INSTRUCTION IN THE FINE ARTS—GENERAL TENDENCY OF AN INCREASED SCOPE OF INSTRUCTION—UNIVERSITIES SHOULD HAVE FOR THEIR OBJECT NOT ONLY THE DIFFUSION OF KNOWLEDGE BUT ITS EXTENSION—TENDENCY TO EXPANSION BY DIVISION OF FACULTIES—CONCENTRATION OF MEANS AND INTELLECTUAL STRENGTH IN A FEW GREAT INSTITUTIONS.

We have seen that the German idea of a university—which is the nearest perfect yet realized—is that of an institution affording the highest and most thorough general culture, in connection with the best instruction and training for the more intellectual professions. The careful reader of the preceding chapter has also noticed a recent disposition to bring other departments than those of theology, law, and medicine within the pale of the learned professions, and thus to extend the area of university education by the incorporation therewith of more or less perfectly developed schools and faculties not formerly included. Political economy and statesmanship are thus making advances toward an ultimate, and indeed an early, recognition as a complete and independent faculty. The universities of Munich and of Tübingen already afford examples of this sort. The fine arts are likewise advancing their claims to a place in the university beside the recognized professions; and the day is probably not very remote when the great schools of art in both the Old and the New World will constitute university faculties. On this side of the Atlantic, Yale College, Michigan University, Washington University at St. Louis, and perhaps several others, have already inaugurated this important change in the constitution of the American university. Moreover, in connection with several of the great German universities, as heretofore stated, and with some of the Italian, various schools of the scientific and more material professions, such as schools of agriculture and of engineering, as well as of veterinary science and of pharmacy, have been established; while the Swiss Federal University at Zurich, the Danish University at Copenhagen, and the Finnish University at Helsingfors, have, of late, each been materially transformed and enlarged by the development therein, or the consolidation therewith, of more or less comprehensive polytechnic schools. Our American universities—those of them, I mean, in which there have been established colleges of agriculture and the mechanic arts—are not without precedent, therefore, as to this mode of enlargement, this innovation upon the constitution and scope of the ancient university.

This same spirit is also manifest, though in a less marked degree, in

the English universities, in whose behalf an effort is now making, first, for the restoration of the old faculties of law, medicine, and theology; and, secondly, for the creation of new departments of study, such as history, political economy, and the fine arts—destined, in course of time, to become full faculties, equal in rank and honor with the others.

It may be assumed, therefore, that a present leading tendency of the university is to an enlargement of its scope by bringing within the range of its educational work the whole circle of superior and special studies, regardless of the relative rank they have heretofore held in the world's estimation. And while it hardly requires a word of argument to show how truly such enlargement is in harmony with the spirit of the age and with the educational wants of the industrial classes, there are certain questions connected with the organization of the new schools thus incorporated, the importance of which is so vital as to require the most careful consideration; for if, by enlarging its scope, we are to degrade the university from its ideal rank as an association of professional schools, bound together by the strong attractive force of a central school or schools of general culture, in which the *wissenschaftliche Geist*, the scientific spirit, of the German university is the animating and controlling principle, and make it a mere aggregation of inferior schools established in the interest of the *Brodwissenschaften*, or bread-and-butter sciences, and loosely held together by a community of sordid aims—if such were the inevitable result of an extension of the boundary lines of the university, then it were a thousand times better that the present narrow limits should remain unchanged, and that the schools of the practical sciences be grouped together on a separate foundation of their own, after the manner of the great separate polytechnicums of Europe or the Industrial University of Illinois. I mean to say, in other words, that the university, as the fountain-head of true learning of every sort, must be maintained at a high level and kept pure at all hazards. It is thus, and thus only, that the intellectual supremacy of a people is either attainable or maintainable; and, accordingly, it is a matter of the greatest moment to determine whether the expansion now in progress must of necessity lead to a degradation of the university standards. Touching this question, there will doubtless be a difference of opinion as to its susceptibility of *à priori* settlement. But, to my mind, no proposition not already placed beyond dispute by actual demonstration is clearer than that it is possible to open the door of the university to every one of the higher branches of study and every one of the numerous professions that engage the intellectual efforts of man, without the least sacrifice of its high character. How should it be otherwise? It is not the sciences alone that are correlative; there is a correlation of all the knowledges, to what domain soever they severally belong; and in their higher range the relation is one of equality of rank, not of diversity. If the votaries of one set up for it a higher claim because, forsooth, in its sublime elevation, it is altogether above the range of the practical, it is because of the

narrowness of their limitations—because they have not yet learned that all knowledge and every kind of learning that is worth anything is both theoretical and practical, and either the one or the other according as it is studied in its essence or in its extension into the sphere of human activities—because they have not yet learned that great yet simple lesson, the essential unity and harmony of all truths, so that it is impossible for any man to know the whole of any one thing until he has gained the mastery of all things. And if, on the other hand, the industrial classes are so generally contemners of the abstract and theoretical, and worshipers of the practical, it is because they have been so long cramped, fettered, and blinded by narrow and foolish notions of an essential antagonism between the different classes of society, and between the different departments in the world of letters, science, and the arts—because they have not yet stood upon a plane of intelligence high enough to see that the real interests of any class are so wisely and beautifully interwoven with the interests of every other, that, practically, the good of one is the good of all; that even the most practical of all the practical sciences has, of necessity, its source in the abstract and theoretical; and that as, in truth, all branches of knowledge are essential parts of one complete system, so the growth and completeness of each is promoted by the utmost intimacy and equality of association.

It seems to me that this very nature of the relation that exists between all the departments of learning, confirmed, as it is, by the known liberalizing power of such association upon the minds of all who are brought within the circle of its influence, is, of itself, convincing proof, not only of the desirableness, but also of the practicability and wisdom, of so enlarging the scope of the university as that it shall become, not in title merely but in reality, a central source of universal knowledge.

May we not consider it settled, then, that this the leading tendency of university education at the present day is philosophical, and therefore entitled to encouragement? Undoubtedly. But encouragement is not all that is wanted; the movement is eminently in need of the guidance of practical wisdom. The uncultured world, seeing, not the secret sources of knowledge and the tedious processes by means of which it has been reached, but only the results, lacks appreciation of profound culture, and is impatient of thorough and protracted courses of study. Leave the university in such hands, and everything would be contemptuously thrown out, with the brand of "useless," that could not yield immediate practical, and for the most part material, results; the branches and departments allowed to remain would be reduced to the narrowest possible limits; all subordinate institutions, from the college down to the primary school, would be correspondingly degraded in their standards; learning and science would quickly degenerate into a pitiful charlatanism; and the most rapidly advancing civilization lapse into a hopeless barbarism.

Here, then, we have the means of security. The university must be

made not only a central source of proved and accepted knowledge, but also a central place of universal culture—an institution a recognized and important office of which shall be to search for and discover the yet concealed truths that wait for new explorers in the universe of mind and matter. It must have for its object the extension as well as the diffusion of knowledge. And its ideal results must be, not simply the learned theologian, lawyer, philologist, and physician; nor yet these supplemented by the successful agriculturist, the skillful architect, the practical engineer, and that entire host of well-trained professional workers who constitute the visible vanguard of the great army of material progress; nor yet a great people, provided with the best conditions of material development, luxuriating in the wealth of its own production and rejoicing in the superiority of its physical power; its ideal results must also, and above all else, include the highest type of individual manhood and a nation pre-eminently distinguished for the high quality of its intellectual culture and the grandeur of its moral influence on the rest of the world. Again, I say, degradation of the university is liable, nay almost certain, to follow in all cases where the idea of a profound and exalted culture is subordinated to the idea of direct practical availability. But insure to the former its legitimate central place in the comprehensive scheme, make the high faculties of general science and philosophy the heart and soul of the whole institution, and it will surely become a vitalizing and elevating influence, holding its "practical" no less than its professional faculties to a higher standard than, as isolated schools, they could possibly attain.

It is needless to say that in America, where, as yet, we have no high faculty of philosophy, and where there is so little of the *wissenschaftliche Geist* in any quarter, and hence so little elevating and sustaining power, there is little danger of a degradation of university standards, for the reason that they are already, and always have been, about as low as they could be got. But does not this very fact, so discreditable to our country, constitute a powerful argument in favor of at once creating such faculties in all our would-be universities, both on their own account and because of their needed influence on the professional faculties, new and old? One thing is certain, namely, that unless measures are promptly taken for the creation of such faculties, that same superficialness which now marks the professional schools of the country will continue to characterize them. Nor will this be the worst of the case; for if our American universities are to continue in their present course of expansion by multiplication of professional schools, without the required improvement in their standards, instead of fulfilling the important office of stimulating and lifting up the colleges and the public schools of the country—an office of the utmost importance, and one for the thorough fulfillment of which they should be held responsible—they are almost certain to degrade them, as a class, even below their present inferior level.

At Yale and Harvard there are signs of an earnest desire to supply this great want of American education; but unless I have misapprehended the present character and objects of the few brief and disconnected courses of lectures thus far offered to their students and to the public generally, they constitute but a single first step of the many that require to be taken, before we shall be able to point to even one faculty of philosophy corresponding in rank to the *philosophische Facultät* of the German university.

But expansion of the university is not likely to stop with the incorporation of new faculties. There is also discoverable a tendency to expansion by the division of existing faculties. In some instances the new faculties amount almost to the creation of a new department, great in its importance and extensive in its scope, around the nucleus of a single branch of study formerly included in one of the ancient faculties. In other cases the new faculties are formed by a natural and equal division of the studies previously embraced in the faculty of philosophy or its equivalent, and the subsequent expansion of these divisions into full faculties, each covering a wider field and demanding of the student the same term of study as a condition of admission to the laureate, as was required previous to the division.

Examples of the first kind are presented by the *staatswirthschaftliche Facultät* of the Bavarian and Wurtemberg Universities, which is an offshoot of the *juristische* or *Juristen Facultät*, as may be seen by reference to the University of Vienna, in which political philosophy, though not yet advanced to the rank of an independent faculty, nevertheless has an important place in the law faculty, there known as the *rechts- und staatswissenchaftliche Facultät*. The schools of engineering, of agriculture, of veterinary science, of pharmacy, &c., already noticed as having, within late years, sprung up in many of the universities of the Old World, also properly belong to this general class.

Examples of the second class—of new faculties formed by the equal division of the original faculty of philosophy, so long the foundation school of the European university, into schools of philosophy and letters, and schools of the mathematical, physical, and natural sciences—are still more common, being found in many countries. Thus in Italy, instead of the ancient faculty of philosophy, we now have, as the basis of the professional faculties, the *facoltà di filosofia e lettere*, and the *facoltà di scienze, fisiche, matematiche e naturali;* in France, the *faculté des sciences* and the *faculté des lettres;* in Belgium, the *faculté des sciences* and the *faculté de philosophie et lettres;* in Denmark, the *philosophiske Facultet* and the *mathematisk-naturvidenskabelige Facultet;* in Holland, the *facultas disciplinarum mathematicarum et physicarum* and the *facultas philosophiæ theoreticæ et literarum humaniorum;* in Russia, the historico-philological faculty and the physico-mathematical faculty. So likewise in this country the same tendency, though on a lower plane and without the same necessity, is observable in the division of the uni-

versity department of general culture into the "regular" or classical and the scientific courses that exist in so many of the universities; while in at least one—the University of Wisconsin—there are found distinct and co-ordinate colleges or faculties of letters and of science and the arts.

Now, if this multiplication by division were nothing more than a partition of studies, with an assignment of the ordinary academic, mathematical, and scientific studies to one division, and the academic courses in language, literature, and philosophy to the other, it is clear that there would be not only no expansion whatever in such cases, but, on the other hand, an actual and very prejudicial contraction of the already too narrow range of studies the completion of which has been essential to the baccalaureate; and yet, practically, it is, with few exceptions, this very partitioning of studies that is now going on in this country. In the European countries, however, the division is either a real expansion, by taking in new studies and extending the upward range of the old ones, or at least a systematic and philosophical arrangement of the numberless studies embraced by the full faculty of philosophy, according to the somewhat different needs—at this advanced stage in the student's life quite beyond the *academic* range—of those who are preparing for the "learned" or for the scientific and "practical" pursuits.

That the faculty of philosophy in the German university has not yet undergone a division similar to those found in the other European countries is doubtless due to the limitless range of this faculty, to the singular freedom of choice allowed to all who attend the courses of instruction embraced, and to the more liberal, though by no means more easy, terms on which the doctorate in this faculty is conferred. Still another reason may be found in the fact that, in Germany, the university is still almost exclusively a door to the "learned" pursuits; admission to the scientific and industrial pursuits being gained chiefly through the technical, industrial, and polytechnic schools, in all of which the German States so far excel. And yet, notwithstanding these peculiarities of the case in Germany, it is by no means clear to my own mind that the university there is not susceptible of improvement by the proper organization of two separate faculties, similar in general cast to those found in the other countries named. Nor is there much doubt that such a change will come, in course of time, with the organization therein of the new faculties of the scientific professions. That freedom of the German university, which, opening the vast domain of letters, science, and philosophy to all who choose to enter upon and occupy it, bids them choose for themselves such range of study as seems most in harmony with their individual tastes and aspirations, and allows them to continue therein even to the end of their days, is most admirable, surely, and should be fostered and protected with the most jealous care. But for such students as have fixed and definite aims sharply outlined, both by their bent of character and the uncompromising necessities of life, there

is doubtless an advantage in finding, already formed, such groupings of studies as have been determined by the wisest educators, and proved by the experience of years to be best calculated to perfect their preparation for their respective callings in life—that is, if we may assume that the student, still feeling his way and only advancing by the aid of others, is less wise than the master, already familiar with the great highway, and even the by-ways, his feet have need to tread.

Intimately connected with this organization of faculties we have the question of discipline; concerning which, however, I deem it important to say only this much, namely: that the manifest and true tendency is a fair compromise between the rigid rule of the French and English universities on the one hand and the extreme license of the German university on the other; neither of which secures the best results. These contrasting policies have naturally grown out of the different governing ideas that characterize the universities of those countries respectively, and which, indeed, are essential to their differences in grade and real character. For the English university, as already shown, is only a *haut lycée*, and in no proper sense a university at all. It proceeds, therefore, upon the hypothesis that the students who resort to it are still boys, whose object is elementary culture and discipline, and whose need is the stimulation of examinations and high prizes and the severe restraints and penalties imposed by arbitrary authority. Whereas the German university is based on the theory that they who resort to its halls are young men already disciplined in mind and fashioned as to habits of intellectual and moral life, and hence duly prepared to enter upon their career of superior study in that true scientific and philosophic spirit whose glory is that it lifts the student by its own inherent power of inspiration high above all need of arbitrary rule and artificial stimulation.

That neither of these theories is perfectly adapted to the end proposed is apparent after a careful investigation; for, in England the proportion of students who attain to anything more than a *pass* degree, or even entitle themselves to that, is very small, while at the best of the German universities it is rare that more than a third of the whole number manifest their possession of the true *wissenschaftliche Geist* by continuous laborious effort during their period of study. Even at Berlin the scientific spirit which animates the whole institution and gives vitality and power to its teaching in every department, fails with the majority to supply the place of official and professional supervision. To the authorities of this, the foremost of the world's universities, it may with propriety be said, "This ought ye to have done and not left the other undone." The scientific spirit is above all price; but even the University of Berlin would accomplish yet more if, to its magnificent material and intellectual provisions for the education of the thousands who throng its famous lecture rooms, there were added such requirements as to attendance, and such frequent tests of progress and profi-

ciency as have ever been found essential to hold the less ambitious and as yet uninspired majority of students to their work.

The English methods being simply a perpetuation of past errors, the French a system begotten of the too military spirit of the nation, and the German policy a natural reaction upon the too rigid systems that had been long in vogue when it was adopted, it is not strange that the leading educators of these and of other countries are at present earnestly striving to determine the golden mean.

Touching the organization of the professoriate, one risks nothing in conceding that the German universities, including the Swiss and Austrian, present the best models; and the wonder is that these have not been already universally adopted by other countries. Extraordinary professors, performing the office of assistants, with moderate salaries or half salaries, and thus supplementing the instruction given by the ordinary professors, at a considerable saving to the funds of the institution, are found, indeed, in all the European universities; but the *Privat-docenten*, giving private lectures on subjects of their own choice, dependent entirely upon their own powers of attraction for auditors and compensation, and powerfully stimulating both extraordinary and ordinary professors, for whose private pupils and fees they are authorized competitors, and for whose very places even they may be aspirants—these are a class of teachers peculiarly German, and a class of whom, in view of the great saving they make to the university, and the quickening and vitalizing influence they exert upon every department and member thereof, it is not too much to say that they are the most important class at present belonging to the university corps of instructors. That so important a feature of the professoriate as this is destined to be adopted at an early day, wherever practicable, seems to me almost certain. But with all the economy that may be used, in their organization and management, it is coming to be understood that it is not possible in any country to establish and maintain a real university without vast sums of money. And accordingly there is observed a corresponding tendency in those countries where the true idea of a university is best comprehended to a concentration of means and intellectual forces in a few great institutions, rather than practically squander them upon a great number of half-endowed, sickly institutions, which are not only not worthy of their high title, but whose meagerness and necessary imperfections constitute them a positive hindrance and curse to the cause of university education. It was the want of a due appreciation of this that led to the establishment in early times of so many universities in Italy and Germany. It will be remembered that as early as the year 1500 Germany alone had fourteen, and that the number continued to increase for a long time after that; every town of the second or third rank insisting on having its university, until at last, yielding to the contempt in which the majority of them had long been held by the learned men of the times, happily sustained by the necessary territorial changes that came of the

political commotions of the eighteenth century, those of them whose life was most sickly, such as those of Erfurt, Mainz, Helmstadt, Frankfort-on-the-Oder, Rinteln, Duisburg, Bamberg, Cologne, Munster, Paderborn, Dillingen, and Salzburg, were suppressed.

Italy, whose mania for numerous universities had run *pari passu* with that of Germany, has not even yet effected the requisite work of suppression. The need of such work has long been felt by leading minds, however, and has at length been fairly undertaken by the government, whose purpose it is, by reducing the number of state universities from fifteen to about half the number, and by the adoption of more thorough regulations for their management, to raise them to the high level of the foremost universities of Germany.

So, also, there is, of late, a growing appreciation in Great Britain of the importance of a more judicious concentration of means upon a less number of institutions, in order to the upbuilding of such as shall be more worthy of the high demands alike made by the country and the times. In pursuance of this felt necessity, the Scotch universities are to be consolidated; Queen's University, Dublin, is empowered to grant the degrees heretofore conferred by the colleges at Cork, Galway, and Belfast; and the University of London is gradually absorbing the degree-conferring powers of a large number of similar institutions in England.

In this country alone, where the ambition of new cities and new States, as well as of numberless religious sects, strongly wars against this true policy of the higher education, the opposite tendency still prevails. But even here more rational ideas of what constitutes a true university, and of the large amount of money and professional talent requisite to maintain such an institution, are rapidly gaining ground; so that we may reasonably hope to see a check, ere long, put upon the present insane policy of multiplication without regard to the necessities of education.

It thus appears that university education, notwithstanding its present low condition in most countries, and its serious imperfections in all, is characterized by tendencies that promise great things for the time to come. So much is already beyond question, namely, that the university of the future is to be not the mere *college* of America, nor even the college supplemented by one or more poorly organized and more poorly equipped professional schools; not that loose aggregation of grammar schools, supplemented by a few poorly attended courses of university lectures, that wear the title, by courtesy, in England; not the French grouping of academical faculties, limited—especially in the departments of letters and science—to a quite too narrow field of study; not the university of Spain, or Portugal, or Italy, from whose faculties for the higher general culture the powers of attraction and inspiration have long since departed; not the Scandinavian or Slavonian university, cast in the mold of mediæval times, or at the best a mixture of the old

and more modern types; nor yet the Germanic university, found, with but minor modifications, in all the States of Germany, in Austria, Switzerland, Holland, and Denmark, and which, though wherever found it presents the highest existing type, is nevertheless everywhere too limited in scope and generally too lax in its regulations—not any of these, but rather an institution more ample in its endowment, broader in its scope, more complete in its organization, more philosophical and practical in its internal regulations, and certainly not less high than the highest in all its educational standards; an institution above and beyond the best of the gymnasia, Latin schools, high schools, academies, and colleges, and, on its own higher plane, existing for the extension and diffusion of all branches of knowledge; a broad and noble institution, where the love of all knowledge, and of knowledge as knowledge, shall be fostered and developed; where all departments of learning shall be equally honored, and the relations of each to every other shall be understood and taught; where the students devoted to each and all branches of learning, whether science, language, literature, or philosophy, or to any combinations of these constituting the numerous professional courses of instruction, shall intermingle and enjoy friendly intercourse as peers of the same realm; where the professors, chosen, as in France and Germany, after trial, from among the ablest and best scholars of the world, possessed of absolute freedom of conscience and of speech, and honored and rewarded more nearly in proportion to merit, shall be, not teachers of the known merely, but also earnest searchers after the unknown, and capable, by their own genius, enthusiasm, and moral power, of infusing their own lofty ambition into the minds of all who may wait upon their instruction; a university not barely complying with the demands of the age, but one that shall create, develop, and satisfy new and unheard-of demands and aspirations; that shall have power to fashion the nation and mold the age into its own grander ideal; and which, through every change and every real advance of the world, shall still be at the front, driving back from their fastnesses the powers of darkness, opening up new continents of truth to the grand army of progress, and so leading the nation forward, and helping to elevate the whole human race. Such an institution would be to the world its first realization of the true idea of a university.

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